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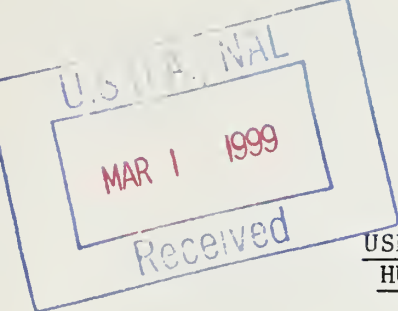
USDA Comprehensive Plan for a National Food and Human Nutrition Research and Education Program

A Report to Congress

**United States
Department of
Agriculture**



National Agricultural Library



USDA COMPREHENSIVE PLAN FOR A NATIONAL FOOD AND
HUMAN NUTRITION RESEARCH AND EDUCATION PROGRAM

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Agency Abbreviations

<u>Agency</u>	<u>Agency Abbreviation</u>
Agricultural Marketing Service	AMS
Agricultural Research Service	ARS
Agricultural Stabilization and Conservation Service	ASCS
Cooperative State Research Service	CSRS
Competitive Research Grants Office	CRGO
Economic Research Service	ERS
Extension Service	ES
Food and Nutrition Service	FNS
Food Safety and Inspection Service	FSIS
Human Nutrition Information Service	HNIS
National Agricultural Library	NAL
Office of Governmental and Public Affairs	OGPA
Office of Grants and Programs Systems	OGPS
Office of International Cooperation and Development	OICD

USDA COMPREHENSIVE PLAN FOR A NATIONAL FOOD AND NUTRITION
RESEARCH AND EDUCATION PROGRAM

A REPORT TO CONGRESS

EXECUTIVE SUMMARY

o Legislative Basis

The development of a comprehensive plan for implementing a national food and human nutrition research program is required by the provisions of section 1452(a) of the National Agricultural Research, Extension, and Teaching Policy Act Amendments of 1985 (7 U.S.C. 3173 note). Section 1452(a) provides as follows:

SEC. 1452.(a) Not later than 1 year after the date of enactment of this Act, the Secretary of Agriculture (hereafter in this subtitle referred to as the "Secretary") shall submit to the appropriate committees of Congress a comprehensive plan for implementing a national food and human nutrition research program, including recommendations relating to research direction, educational activities, and funding levels necessary to carry out such plan.

Section 1452(b) requires the Secretary annually thereafter to submit a report on the human nutrition research activities conducted by the Secretary.

o Preparation of Plan

The development of this Comprehensive Plan for a National Food and Human Nutrition Research and Education Program was coordinated through the Subcommittee for Human Nutrition of the Department's Research and Education Committee. Contributors to the report included Subcommittee members representing the Agricultural Research Service, the Cooperative State Research Service, Economic Research Service, Food and Nutrition Service, Human Nutrition Information Service, Office of Grants and Programs Systems, Office of International Cooperation and Development, Agricultural Marketing Service, Extension Service, Food Safety and Inspection Service, National Agricultural Library, Office of Information, and Agricultural Stabilization and Conservation Service.

Acknowledgement is given to the Human Nutrition Board of Scientific Counselors' Task Group on Research Accomplishments and to the several other internal and external reviewers for their comments and suggestions.

In the preparation, the many specific roles of USDA agencies were identified as they relate to the Department's broad Food and Nutrition Research and Education Program. The Plan includes statements of the Department's mission, legislative authority, and declared policy for food and human nutrition research and education. The Department's program resources and infrastructure are described for human nutrition research, consumer information and education, food assistance, food inspection and marketing.

o Purpose of Plan

It is the policy of the USDA to promote optimal human health and well-being through improved nutrition, recognizing the importance of coordination of its human nutrition related activities with other governmental agencies, industry, and private or public institutions. The intent of the food and nutrition policy is to ensure the availability of a sufficient, safe and nutritionally adequate supply of food and to provide research-based information by which all persons can select a healthful diet. The human nutrition research mission is to define nutritional requirements necessary for maintenance of optimal human health, performance, and well-being at all stages of life and to define dietary practices to meet those requirements. The human nutrition information and education mission is to improve professional and public understanding of dietary practices that might be expected to maintain nutritional health and well-being.

The purpose of the plan is to describe specific food and human nutrition research and education activities that the Department expects to emphasize in the accomplishment of its broad mission. This national USDA plan supports directly the Federal Five-Year Plan, and is designed to foster the development of research strategies and coordination of human nutrition research and education activities within the Federal Government and with the private sector.

o Content of Research Program

The USDA research in food and human nutrition consists of six areas of research. These are:

- Normal human requirements for nutrients
- Energy metabolism and role of nutrients in health promotion
- Food composition and bioavailability of nutrients
- Food and nutrition monitoring research
- Food and nutrition information and education research
- Research on effects of government policy and socioeconomic factors on food consumption and human nutrition

The first five areas of the USDA research program in food and human nutrition fit well into the Federal Five-Year Plan. The sixth area on effects of government policy and socioeconomic factors on food consumption and human nutrition is necessary for agricultural food assistance, regulatory, and nutrition education programs administered by USDA. The USDA program gives heavy emphasis to requirements of nutrients by normal humans and to the composition and bioavailability of nutrients in foods. The program does not include research on the role of nutrients in the treatment of chronic diseases or disorders. It does, however, include studies on the role of fats, carbohydrates, fiber and other dietary components in health promotion or prevention of nutrition-related disorders.

o Content of Information and Education Programs

The collective information and education activities of several agencies form USDA's current Food and Nutrition Education Program. Through Agency educational materials and activities, established food and nutrition knowledge is restated and findings from new research are introduced. Although the ultimate goal of each Agency is to help individuals improve their nutritional health and well-being through informed food choices, Agency programs differ as to message content, audience, phase of the education process involved, organizational levels at which program is conducted and whether its objective is educational or informational.

The plan for the next 5 years focuses primarily on improved coordination of activities of USDA agencies at the Federal level and the increased use of nonprint means of communication. USDA's Subcommittee for Human Nutrition of the Committee on Research and Education will serve as the overall coordinator. Food and nutrition information and education programs will have four major goals:

- Assure that the Federal government "speaks with one voice" when issuing dietary guidance.
- Improve linkages between research and information and education activities.
- Coordinate message delivery activities to cover broader audiences through the use of various delivery systems shown to be effective through research.
- Evaluate Departmental information and education efforts and identify needs for change or for new nutrition education research activities.

o Funding Levels

The expenditures for human nutrition research and human nutrition education and information by the several agencies in USDA for fiscal years 1982 through 1985 are summarized in Table 2. The estimated expenditures for FY 1986 and the budget for FY 1987 are also included. The total amount of human nutrition research support has increased from \$43.5 million in fiscal year 1982 to \$56.5 million in fiscal year 1987, an increase of 29.9 percent. During the same period, support for human nutrition education and information has increased from \$123.6 to \$135.2 million, an increase of 9.4 percent. Most of these education and information funds are distributed to and managed by State agencies. The total support for human nutrition in the FY 1987 budget is \$191.7 million.

o Coordination

Coordinating bodies and advisory mechanisms are described. These include:

- Interagency Committee on Human Nutrition Research (coordinates at Federal level)
- Subcommittee for Human Nutrition of the USDA Research and Education Committee (coordinates within USDA)

- Human Nutrition Board of Scientific Counselors (advises the Secretary of Agriculture)
- Dietary Guidelines Advisory Committee (advises the Secretaries of USDA and DHHS)
- USDA Dietary Guidance Working Group (helps USDA agencies speak with one voice)
- Joint Nutrition Monitoring Evaluation Committee (reports to Congress on USDA/DHHS monitoring activities)
- National Advisory Council on Child Nutrition (advises USDA on programs)
- National Advisory Council on Maternal, Infant and Fetal Nutrition (advises USDA on programs)
- Ad Hoc Committee on Health Promotion Through Schools (coordinates at Federal level)
- USDA/DHHS Nutrition Education Committee for Maternal and Child Nutrition Publications (coordinates at Federal level)

Several examples of informal coordination also are given.

o Strategies

A successful program in food and nutrition research and education involves the determination of nutrient needs and food sources of these nutrients. It also requires monitoring of food consumption practices and the nutritional quality of diets, as well as the development of information and techniques to foster the selection of healthful diets by Americans. The program's effectiveness hinges on problem-oriented research, coupled with research-based nutrition education of professionals and the public. Nutrition education efforts may provide industry with the opportunity to market successfully modified and nutritionally improved food products. This is one way that new research discoveries can be instrumental in bringing about changes in the food supply.

Key strategies in this National Food and Nutrition Research and Education Program are as follows:

Strategy 1 - USDA will conduct problem-oriented food and nutrition research on problems of national importance to policy makers, nutrition and health professionals, to food producers and processors, and to the public at large.

Strategy 2 - USDA will place increasing emphasis on a multidisciplinary approach to research, the establishment of centers of excellence, and use of databanks.

Strategy 3 - USDA will expand its capacity to monitor the food consumption and dietary status of Americans as part of a USDA/DHHS Operational Plan for Nutrition Monitoring.

Strategy 4 - USDA will continue to coordinate food and human nutrition program activities with those of other Federal agencies, State and local agencies and of the private sector.

Strategy 5 - USDA will continue to emphasize and strengthen its activities in technical transfer, information and education in the area of food and human nutrition.

Strategy 6 - The message content for USDA's food and human nutrition information and education objectives will be centered around the Dietary Guidelines for Americans, and USDA, working with DHHS, will strive to ensure that all governmental agencies "speak with one voice" in providing dietary guidance to consumers.

o Benefits

Benefits of longer, more active, and more satisfying lives can be expected from improved nutritional knowledge during the next decade. Benefits will result because food producers or processors are able to improve the nutritional quality of food products, because educators are able to help Americans and people in developing countries adopt improved dietary practices, because Government agencies are able to deliver better nutrition services in the administration of food programs for the needy or because physicians are able to improve health care. For the consumer, better health may be enjoyed through improved nutrition resulting from diets that provide appropriate amounts and forms of nutrients. People will be more nearly able to achieve their full genetic potential, including resistance to disease, intellectual development and physiological well-being. In the U.S., significant consequences can result from improved nutrition. For people of the developing world, with their considerable nutrition problems, these health consequences can be immeasurably greater.

I. INTRODUCTION

A. Charge

Section 1452(a) of the National Agricultural Research, Extension, and Teaching Policy Act Amendments of 1985 (7 U.S.C. 3173 note) requires the Secretary of Agriculture to submit to the appropriate Committees of Congress by December 28, 1986, a comprehensive plan for implementing a national food and human nutrition research program, including recommendations relating to research directions, educational activities and funding levels necessary to carry out such a plan. This report is hereby submitted in response to that mandate. Attention also is called to a related report on "Human Nutrition Research: The Federal Five-Year Plan" prepared by the Interagency Committee on Human Nutrition Research (ICHNR) in March 1986, in response to a request from the Office of Science and Technology Policy and the Congress (House of Representatives Joint Committee on Agriculture and the Committee on Science and Technology).

B. USDA's Food and Nutrition Policy

It is a policy of the USDA to promote optimal human health and well-being through improved nutrition. The Department recognizes the importance of coordination of its human nutrition-related activities with the agricultural/food industry, other governmental agencies, and private or public institutions.

USDA has the mission to encourage the production and availability of a sufficient, safe, and nutritionally adequate supply of wholesome food for Americans and help and encourage other countries to meet their food requirements. The United States Department of Agriculture, in support of this mission, will:

- a Conduct research in the area of human nutrition and food science, including human dietary requirements, nutritional status assessment, food composition, utilization of foods, and food safety.
- b Provide food and nutrition education and guidance based on research, thus helping to provide useful information to individuals to assist them in selecting diets to improve their health and well-being.
- c Encourage the training of professionals with expertise in human nutrition and related fields and encourage action to assure the nation of sufficient human capital in this area.
- d Assess the nutritional adequacy of domestic food supplies to identify nutrition and food related problems and to develop strategies for improving them.
- e Monitor food use and food consumption patterns among the nation's population, in cooperation with the U.S. Department of Health and Human Services, to

determine areas where nutritional guidance, food assistance, and food production programs may be focused.

- f Conduct domestic and international food assistance and distribution programs to improve the nutritional quality of diets.
- g Work cooperatively with governments and institutions of other countries and with international organizations to identify world food and nutrition related problems and to develop multilateral approaches for correcting them.

C. Research Mission in Human Nutrition

The American diet is changing. The ever-growing variety of agricultural products, as well as the new processed foods that are being produced at increasing rates, are major contributing factors. The potential impact of these changes on human nutrition must be anticipated to ensure that the nutritional quality of our food supply does not deteriorate. This requires knowledge that can only be derived from interdisciplinary efforts, interfacing nutrition research with pre- and post-harvest agricultural science and technology.

Mission: Plan and conduct research to define nutritional requirements and dietary practices to meet these nutritional requirements necessary for maintenance of maximum performance and optimum human health and well-being in the American people at all stages of life.

The major effort in USDA is to understand the relationship of food and its nutrients to health maintenance and well-being in healthy individuals. The major components of the research program include emphasis on:

- o Infant and child populations to determine nutrient needs for optimal growth, development and function.
- o Pregnant and nursing women to determine nutrient needs and food requirements for themselves and their children.
- o Adult population to determine the biological functions of, requirements for, and interactions among essential nutrients and other dietary components supplied by foods; to evaluate the metabolic effects of dietary proteins, fats, sugars, and fiber so as to determine optimal intakes from available foods.
- o Aging populations to determine nutrient needs; influences of nutrient intake on changes in metabolism and functions of body systems as related to aging; and the effects of nutrition and diet on tissue functions and the onset of chronic diseases.
- o Nutrient data bank to provide comprehensive information about the nutrient composition of all foods important in American diets.
- o Food consumption surveys to permit the monitoring of food and nutrient consumption and eating practices of the population and of subpopulations at

nutritional risk and to appraise diets for their nutritional and other characteristics.

- o Guidance and education research to develop and evaluate materials and techniques for increasing the food and nutrition knowledge of professionals and consumers for the improvement of food selection and management in homes and institutions.
- o Methodology development in support of dietary intake surveys, nutrition status monitoring programs, nutrition intervention and food assistance programs.
- o International food and nutrition problems to develop multilateral approaches to their solution.
- o Food assistance and distribution to evaluate programs and improve quality of diets.

To carry out this research mission, the Department maintains five human nutrition research centers and a nutrient composition data bank, and conducts national food consumption surveys periodically. In addition, the Department administers cooperative research support to 1862 and 1890 land-grant colleges and universities as well as a competitive extramural research grants program in human nutrition. Each research group focuses on specific components of the overall program. Together, a broad range of nutrition research studies are conducted, and in the process innovative methodologies, techniques, and instruments are developed that benefit scientists in many other fields. Research groups look at nutrition questions from many angles and scientific perspectives--from research to education, and from biochemistry to appraisal of food plans. Their individual areas of expertise can be brought together to solve complex national problems.

This strength and diversity of effort that USDA brings to an area of intense public and scientific interest continues to increase our understanding of the important role that nutrition plays in health and well-being. The knowledge gained through this human nutrition program is used by numerous groups including industry; agricultural producers; scientific and health communities, especially nutritionists and dietitians; government agencies; and consumers.

D. Information and Education Mission in Human Nutrition

Discovery through research is the initial step, but interpretation and dissemination of research results are needed for society to capitalize on evolving technology. USDA provides this critical education link, primarily through the Extension Service, with its roots in the Land Grant university system and its chief mission to provide for technology transfer to the public via educational and informational programs.

Two important assumptions underlie government's role in nutrition education. First, dietary habits are important to the health and productivity of the population. Second, basic decisions about lifestyles and eating habits must be left to individual consumers. Thus, it is widely accepted that government does

have a responsibility to make available reliable information, derived from advances in nutrition science, in ways that will help consumers make informed choices about diet. The component of "informed choices" as the goal in helping consumers make food-related decisions is highly valued and is to be encouraged in our society.

Mission: Provide food and nutrition information and education based on research to all Americans to assist them in making informed decisions about the selection and handling of foods, thereby improving their health and well-being.

USDA has a long and proud history of providing food and nutrition information and education to the public, dating back to the turn of the century. However, these programs face new challenges through the remainder of the twentieth century and beyond. Challenges stem from the growing complexities of nutritional science, the diversity of the food supply, changing lifestyle patterns, and the type of nutrition information (and misinformation!) that individuals receive. Nutrition education programs must be responsive to the changing demographic profile of the population, particularly in regard to age, ethnic diversity, and changes in family structure, workforce composition, and lifestyles. Public health conditions and nutrition research point to shifts in nutrition education priorities toward diet-related public health issues such as reducing low-birth weight, obesity, hypertension, osteoporosis, coronary heart disease, cancer, and other chronic diseases.

Beyond the need for an appropriate research base, development and implementation of an effective nutrition information and education program involves answering three questions:

- What are essential food and nutrition messages?
- To whom should these messages be communicated?
- What materials and communication techniques should be used?

These three questions will be addressed in the USDA Food and Nutrition Information and Education Program outlined in Section IV.

E. Legislative Authority for Nutrition Research and Education

1. Research

Authority for nutrition research derived originally from the general mission mandated by Congress when the Department was established on May 15, 1862. Numerous authorizations by Congress since that time have charged USDA with conducting research in a broad array of subjects related to nutrition within the framework of the "food and agricultural sciences." USDA was given explicit authority to conduct human nutrition research in Section 1 of the Bankhead Jones Act of 1935, as amended in 1946 (7 U.S.C. 427). This legislation directed USDA to

"conduct and to stimulate research into the laws and principles underlying the basic problems of agriculture in its broadest aspects, including but not limited to ...research into the problems of human nutrition and the nutritive value of agricultural commodities, with particular reference to their content of vitamins, minerals, amino and fatty acids, and all other constituents that may be found necessary for

the health of the consumer and to the gains or losses in nutritive value that may take place at any stage in their production, distribution, processing, and preparation by the consumer...and including such investigations as have for their purpose...the maximum contribution by agriculture to the welfare of the consumer."

The Organic Act of 1862 was amended in 1977 to include the words "human nutrition" and to read "There shall be at the seat of government a Department of Agriculture, the general design and duties of which shall be to acquire and diffuse among the people of the United States useful information on subjects connected with agriculture, rural development, aquaculture, and human nutrition in the most general and comprehensive sense of those terms...."

The National Agricultural Research, Extension, and Teaching Policy Act of 1977 (7 U.S.C. 3101 et seq.) established USDA as the lead agency of the Federal Government for research, extension, and teaching in the food and agricultural sciences, and directed that research into food and human nutrition be established as a separate and distinct mission of the Department. With this legislation Congress supported USDA's traditional emphasis on the nutritional needs of normal, healthy individuals rather than the needs of individuals requiring clinical or therapeutic dietary support. Congress recognized, however, that nutrition research necessarily addresses the issues of maintenance of health and the prevention of disease and disorders associated with nutrient deficiencies or excesses, and expressed the need for coordination between the two Departments. In Section 1405, the Act states that:

"The Department of Agriculture is designated as the lead agency of the Federal Government for agriculture research (except with respect to the biomedical aspects of human nutrition concerned with diagnosis or treatment of disease), and the Secretary, in carrying out the Secretary's responsibility, shall...establish jointly with the Secretary of Health, Education, and Welfare procedures for coordination with respect to nutrition research in areas of mutual interest."

In Section 1421, the 1977 Act states:

"(a) Congress hereby finds that there is increasing evidence of a relationship between diet and many of the leading causes of death in the United States; that improved nutrition is an integral component of preventive health care; that there is a serious need for research on the chronic effects of diet on degenerative diseases and related disorders; that nutrition and health considerations are important to United States agricultural policy; that there is insufficient knowledge concerning precise human nutritional requirements, the interactions of the various nutritional constituents of food, and differences in the nutrition requirements among different population groups such as infants, children, adolescents, elderly men and women and pregnant women; and that there is a critical need for objective food safety, the potential of food enrichment, and means to encourage better nutritional practices."

"(b) It is hereby declared to be the policy of the United States that the Department of Agriculture conduct research in the fields of human nutrition and the nutritive value of foods and conduct human nutrition education activities..."

The above are only a few of the statutory authorities for USDA food and nutrition research activities.

The acquisition and dissemination of nutrition knowledge have been continuing functions of USDA since its inception. For example, the first report of the Secretary of Agriculture, in 1889, included a report by Harvey W. Wiley, dealing with food and ingredient analyses. Wiley's analyses and those of Dr. W. O. Atwater, the first director of the experiment stations of USDA, were compiled into the first tables of food composition in the United States.

Throughout this century, USDA researchers have contributed importantly to our understanding of the physiology of nutrition and nutritional requirements of humans and animals. Their contributions include basic information on energy metabolism (calorimetry); digestion of food; absorption of nutrients, including vitamins, minerals, fats, carbohydrates, protein, amino acids, and trace elements; relations between nutrition and functions, both physiological and behavioral; and nutritional toxicology.

The first of six national surveys of food consumption was conducted in 1935-36. Results indicated that the diets of one-third of the Nation's families rated poor by nutritional standards. These findings added impetus to efforts to enrich flour and bread with B vitamins and iron, to initiate food assistance programs, and to increase nutrition education.

2. Information and Education

Legislative authority for nutrition education and information dissemination by the U.S. Department of Agriculture is of two types: 1) broad authority given to the Department and/or its Secretary, and 2) specific program enactments.

Broad bases of authority

Two early acts of Congress provide broad statutory authority for extension activities of the Department of Agriculture. They are the Department of Agriculture Organic Act of 1862 (7 U.S.C. 2201), and the Smith-Lever Act of 1914.

The Organic Act of 1862 was the basic legislation that established the Department of Agriculture and authorized its functions. It calls for a Department: "the general design and duties of which shall be to acquire and diffuse among the people of the United States useful information on subjects connected to agriculture and rural development." A 1977 amendment added "--aquaculture and human nutrition--" to subjects specified.

The Smith-Lever Act of 1914, directed USDA to undertake cooperative extension work with State and local agriculture agencies "in order to aid in diffusing among the people of the United States useful and practical information on subjects relating to agriculture and home economics..." A 1953 amendment to the Smith-Lever Act specified nutrition as well as agriculture and home economics as such information topics and authorized "the necessary printing of information."

The National Agricultural Research, Extension, and Teaching Policy Act of 1977 directed the Secretary to carry out the following specific functions related to nutrition education and information: (1) Conduct research in human nutrition education activities; (2) coordinate research, extension and teaching in the food and agricultural sciences conducted or financed by USDA or by other Federal agencies; (3) establish a national nutrition education program to disseminate results of food and human nutrition research performed by USDA; and (4) establish a Food and Nutrition Information and Education Resources center within the National Agricultural Library.

The National Agricultural Research, Extension, and Teaching Policy Act Amendments of 1981 emphasized the partnership between the Federal Government and the States, and expressed support for human nutrition: "...there is an increasing need to address nutrition research and educational issues associated with diet resulting with changing lifestyles and with respect to special groups such as the elderly, teenagers, infants, and pregnant women." The Act requires that "results of agricultural research are effectively communicated" to all users who can benefit therefrom, including consumers. "Food and nutrition" is specified as a component of food and agricultural sciences covered in the Act.

Specific program enactments

Certain enactments, some creating nutrition education components to existing programs, provide more specific statutory authorities. Examples follow:

- o The Federal Meat Inspection Act of 1906 and the Poultry Products Inspection Act of 1937 provide the basis for the dissemination of food safety information by USDA.
- o The National School Lunch Program, established by the National School Lunch Act of 1946, has been expanded since 1966 to include components on nutrition education under the Child Nutrition Act of 1966 and an amendment in 1970.
- o The Nutrition Education and Training (NET) program provides grants to the States for nutrition education for school children and school food service personnel under the National School Lunch Act and Child Nutrition Act Amendments of 1977.
- o The Special Supplemental Food Program for Women, Infants and Children (WIC) provides for nutrition education for participants, training for persons conducting nutrition education, and materials for use in the program (prepared with comment by the Department of Health and Human Services). The Child Nutrition Act of 1966, as amended in 1975 is authority for this nutrition education activity.
- o The Expanded Food and Nutrition Education Program (EFNEP) had its beginning in 1968 with an Act to Amend the Agricultural Adjustment Act of 1935. It was expanded in 1970 and 1977 legislation under the Smith-Lever Act as 3(d) funding to "...enable low-income individuals and families to engage in nutritionally sound food purchasing and preparation practices." It also provided for the hiring and training of paraprofessional aides from the

indigenous target population to do direct nutrition education of low-income families and youth.

- o The Human Nutrition Information Service has been referred to by the House of Representative Committee of the 1986 Agriculture, Rural Development and Related Agencies Appropriation Bill as the principal Federal agency in the study and dissemination of nutritional information, and is expected to "provide the policy basis for issuing Federal nutritional guidance to the public." The Appropriations Committee directs the agency to coordinate with others "to ensure that Government speaks with one voice in issuing the most accurate available nutritional information."

F. Uniqueness of USDA's Role in Human Nutrition

USDA human nutrition research and education has traditionally been linked with the nutritive value of foods, human nutritional needs, and the kinds and amounts of foods that Americans consume relative to their needs and strategies for improving diets.

Since people get their nutrients from foods, the application of nutritional knowledge often leads to changes in the kinds and amounts of foods people consume, and hence often the demand for food. Similarly, any improvement in nutritional quality of the foods we eat must involve corresponding changes in the agricultural food system. Nutrition of individuals, or of population groups, depends on the nutrient content of foods available and a host of factors that occur in the "food chain" before food becomes available for consumption. These factors generally fall into one of three categories: production, processing and storage, and distribution and marketing.

For USDA to ensure an adequate supply of high-quality food, an intimate knowledge of food composition, of the biological effects of food constituents, and of nutritional requirements of humans is needed. The role of U.S. agriculture in human nutrition and health becomes clearer as one is able to predict the effects of agricultural practices used in producing, processing, storing, and marketing of foods on their nutritional quality. For example, the fat content of meat can be modified through genetic and nutritional factors. Plant varieties with better nutritional qualities can be developed. Processing and storage methods also may have importantly different nutritional effects on foods. Similarly, the levels and bioavailability of certain essential minerals such as iron and zinc may be influenced by production and processing procedures.

Experience suggests that some human nutrition problems, especially those that are national, are partially solvable through modification of the agricultural food system. This requires a systematic evaluation of the food chain linking it to the specific human nutrition problem. USDA is equipped uniquely to find such solutions to national nutrition problems. Its research findings on human nutrient requirements, food composition and bioavailability of nutrients, food consumption trends, and nutrition education strategies relate directly to the solution of these problems. Its food policy is geared toward the development and maintenance of a food supply of high nutritional quality.

II. RESOURCES AND INFRASTRUCTURE

The USDA conducts a wide range of research, education and information, regulatory and food assistance activities in carrying out its mission. These activities are distributed throughout several agencies within USDA and are coordinated through the Department's Subcommittee for Human Nutrition of the Research and Education Committee of the Secretary's Policy and Coordination Council. The Assistant Secretaries for the agencies conducting these activities are:

Assistant Secretary John W. Bode
Food and Consumer Services
207 W Administration Building

Assistant Secretary Orville G. Bentley
Science and Education
217 W Administration Building

Assistant Secretary Kenneth A. Gilles
Marketing and Inspection Services
228 W Administration Building

Assistant Secretary Robert Thompson
Office of Economics
227 E Administration Building

Under Secretary Daniel G. Amstutz
International Affairs and Commodity Programs
212 A Administration Building

A brief description of some of these activities by Agency and the name of a contact person follow.

A. Human Nutrition Research Agencies

1. Agricultural Research Service, T. B. Kinney, Jr., Administrator

The mission of the Agricultural Research Service (ARS) is to implement research designed to produce new knowledge and technologies required to ensure continuing vitality of the Nation's food and agriculture enterprise. Promoting optimum health and well-being through improved nutrition is one of six major objectives of the ARS strategic program plan (U.S. Dept. Agr. Misc. Pub. 1429, January 1983). Four approaches to achieve this objective are identified.

- o Define nutrient requirements at all stages of life.
- o Determine the nutrient content of agricultural commodities and processed foods as eaten and establish the bioavailability of nutrients in these foods.
- o Improve human nutrition status by making available techniques to assess the effectiveness of nutrition programs.

- o Integrate knowledge of human nutritional needs into the agricultural/food system.

The ARS human nutrition research is conducted primarily at five separate Human Nutrition Research Centers and at Regional Research Centers. The centers maintain close communication with each other and the research programs are coordinated through the National Program Staff. Each center has a different research thrust and provides its unique contribution.

Contact: Gerald F. Combs, Assistant Deputy Administrator for Human Nutrition - 301/344-3216

Beltsville Human Nutrition Research Center, Beltsville, Md. The history of the Beltsville Human Nutrition Research Center can be traced to 1894, when Congress authorized the Office of Experimental Stations with headquarters at Wesleyan University in Middletown, Conn., to carry out human nutrition investigations. The headquarters was moved to Washington, D.C., in 1906, and to Beltsville, Md., in 1941. The mission of the Center is to: (1) conduct research relevant to human requirements for energy, protein, carbohydrates (including fiber), lipids, vitamins and minerals and their bioavailability (including effects of interactions with other food components); (2) develop dietary strategies which can lead to postponement of the onset of nutritionally related debilitating diseases; and (3) design and develop new or improved methods for the analysis of nutrients in foods as eaten and to use them to provide accurate and precise analyses suitable for transfer to appropriate user groups. This Center, which occupies three buildings at the Beltsville Agricultural Research Center, has a Human Studies facility which includes a newly constructed room size calorimeter and areas for preparing and feeding experimental diets to approximately 60 subjects at one time. It is composed of laboratories on carbohydrate nutrition, lipid nutrition, vitamin and mineral nutrition, energy and protein nutrition, and nutrient composition. Emphases at this center are on the nutritional requirements of adults, dietary risk factors associated with nutrition-related disorders, and development of food composition analysis methods.

Contact: Walter Mertz, Director - 301/344-2157

Children's Nutrition Research Center at Baylor College of Medicine, Houston, Tex. The Children's Nutrition Research Center (CNRC), established in 1979 in response to Congressional mandate, is the only center that deals exclusively with research on nutrient needs and nutritional status of mothers, infants, and children. Its mission is to define the diets that will ensure nutritional health in pregnant and lactating women and in infants and children through adolescence. To accomplish this, the CNRC strives to determine how the diet of the pregnant woman affects the health of her child, to determine how the diet of the mother affects lactation and the nutrient content of her milk, to determine the relationship between diet and physical and mental development of infants and children and to investigate the dietary requirements of infants, children, adolescents, and pregnant and lactating women. A unique facility within the Center is the Stable Isotope Laboratory which has the capacity of measuring nutrient needs in a noninvasive manner with precision. The Center's 11-story building is expected to be completed in FY 1988. Emphasis is being given to protein and energy requirements of women for pregnancy and lactation and of

infants and children for growth. Stable nonradioactive isotopes are used as tracers of individual nutrients to determine their absorption and utilization.

Contact: Buford Nichols, Director - 713/799-6006

Grand Forks Human Nutrition Research Center, Grand Forks, N. Dak. The Grand Forks Human Nutrition Research Center was established in 1970. Its mission is to develop recommendations for nutrient intakes by humans and to identify useful nutrient forms, with particular emphasis on mineral requirements. Although the main thrust of research is directed toward the role of trace elements in nutrition, other essential nutrients (for example, protein, carbohydrate, and fat) also are studied. Newly expanded facilities designed for studies of trace element requirements and metabolism include a human metabolic unit, kitchen and dining facility capable of accommodating 14 free-living volunteer subjects and environmentally controlled animal care facilities. In addition, collaborative studies are done with scientists at various universities and at other ARS locations.

Contact: Forrest Nielsen, Acting Director - 701/775-8353

Human Nutrition Research Center on Aging at Tufts University, Boston, Mass. The Human Nutrition Research Center on Aging was established in FY 1980 in response to a mandate of Congress. Its mission is to determine the nutrient needs of the elderly and the relationship of dietary factors to the aging process. Investigations are carried out to determine the influence of diet on the onset and course of aging and the manner in which diet can delay or prevent the onset of degenerative conditions associated with aging. The center's new 15-story facility on Tufts Health Sciences Campus in downtown Boston is uniquely suited to serve the multidisciplinary teams that will carry out the center's objectives. A 28-bed Clinical Research Unit, adjacent to a special metabolic kitchen, is available solely for studies of nutrition and aging. The center has a Human Physiology and Exercise Laboratory, and a complete Nutrition Evaluation Laboratory as well as environmental control systems for relevant experimental animal research.

Contact: Irwin Rosenberg, Director - 617/956-0302

Western Human Nutrition Research Center, the Presidio of San Francisco, Calif. The Western Human Nutrition Research Center was established on April 6, 1980, when Congress ordered the transfer of the nutrition research program of the Army, located at Letterman Army Institute of Research, Presidio of San Francisco, to the USDA. The mission of the center is to improve methods for assessing human nutritional status and to study the factors that lead to malnutrition. This center also conducts studies on human nutritional requirements and on factors that influence them, with emphasis on vitamin requirements. The center with 20,000 square feet has a 12-bed, completely equipped human nutrition suite, and an animal facility consisting of 20 animal rooms. It is capable of conducting the full scope of human nutrition research. It's location is ideal with the Western Regional Research Center in Albany and the University of California complex in Berkeley, San Francisco, and Davis.

Contact: James M. Iacono, Director - 415/556-9697

Plant, Soil, and Nutrition Laboratory, Ithaca, N.Y. This laboratory was established as a National Laboratory to investigate the cause and effect relationships between plants, soil, and nutrition. Implicit in this mission is that the laboratory study the contributions of the soil to the nutritive value of food plants. Of special interest has been the effect of mineral supply on plant constituents such as amino acids and vitamins, mineral forms in plants, transport through the plant, and availability to man and animals. Effects on toxic substances in plants also are studied.

Contact: Darrell Van Campen, Laboratory Director - 607/256-5480

Regional Research Centers. Since adequate human nutrition translates directly to the need for an ample supply of wholesome, high-quality foods and food products, it is important that other parts of the food chain be concerned about solutions to nationally important food and nutrition problems. Accordingly, other ARS research centers are involved in research important to achieving the human nutrition objective. These include the Eastern Regional Research Center, Philadelphia, Pa.; Northern Regional Research Center, Peoria, Ill.; Southern Regional Research Center, New Orleans, La.; Western Regional Research Center, Berkeley, Calif., and the Richard Russell Research Center, Athens, Ga. These centers focus on specific areas of research directed at food production, food processing, food storage, distribution and marketing, and food safety.

Contact: Gerald F. Combs, Assistant Deputy Administrator for Human Nutrition - 301/344-3216

2. Cooperative State Research Service, J. Patrick Jordan, Administrator

Research at State Agricultural Experiment Stations and 1890 Land Grant Institutions

The Cooperative State Research Service (CSRS) is responsible for administering and coordinating funds appropriated under the Hatch Act and Section 1 of the Bankhead Jones Act of 1935, as amended in 1946 (7 U.S.C. 427) to State agricultural experiment stations, to 16 "1890 land-grant schools" and to Tuskegee University to carry out research on food and agricultural issues, including human nutrition. Matching funds, often in excess of the amount of Federal funds, are provided by the States. These projects in the area of nutrition often focus heavily on nutrient bioavailability and the composition of foods, determination of nutrient requirements, metabolic functions of nutrients and interactions, dietary and nutritional status of special populations, dietary patterns, and alterations in the nutritional value of food supply resulting from changes in production, processing, or marketing practices.

Contact: George Mountney, Nutritionist, Natural Resources, Food and Social Sciences - 202/447-3444

Office of Grants and Program Systems

- o Competitive Research Grants Office. The Competitive Research Grants Office (CRGO) was established in 1978 to implement a section of the Food and Agriculture Act of 1977. CRGO awards competitive grants to support basic research in human nutrition with emphasis on determining nutrient requirements. The objective is to support creative research that fills gaps

in the knowledge of nutrient requirements, bioavailability, the interrelationships of nutrients, and the nutritional value of foods consumed in the United States. Special attention is given to the study of trace constituents of foods and their effect in healthy humans. According to the Congressional mandate, awards are based on peer reviews and the program is open to applicants from the broadest possible spectrum of research institutions in the United States.

Contact: Anne Holiday Schauer, Associate Chief - 202/475-5022

- o Small Business Innovation Research Program. Under the authority of the Small Business Innovation Development Act of 1982 (Public Law 97-219), the U.S. Department of Agriculture awards research grants to small business firms in selected areas of research including food science and human nutrition. Grants are awarded competitively based on technical and scientific merits. The objectives of SBIR program include stimulating technological innovation in the private sector, strengthening the role of small businesses in meeting Federal research and development needs, increasing private sector commercialization of innovations derived from USDA-supported research, and fostering and encouraging minority and disadvantaged participation in technological innovation. The scope of food science and nutrition research areas ranges from basic biochemistry, chemistry, and toxicology to food processing and economic studies in market development and analysis.

Contact: Olga Owens, Acting SBIR Coordinator - 202/475-2044

3. Economic Research Service, John E. Lee, Jr., Administrator

The Economic Research Service (ERS) conducts a wide variety of research and analysis on food and agricultural issues, some of which relate to human nutrition. Research is conducted on food consumption patterns and their determinants, changes in dietary practices, and the effects of government policies and socioeconomic factors on food consumption. These studies use data from existing surveys such as the Bureau of Labor Statistics' (BLS) Continuing Consumer Expenditure Survey, USDA's Continuing Survey of Food Intake of Individuals and Survey of Household Food Consumption, and the Department of Health and Human Services' Health and Nutrition Examination Survey.

Food Consumption Patterns. ERS develops estimates of annual per capita food consumption and analyzes annual changes and trends. This information is developed through analyses of the supply and utilization of agricultural commodities. ERS prepares an annual statistical bulletin containing current and historical data on food consumption, prices, and consumer expenditures. ERS estimates are used by nutritionists in USDA's Human Nutrition Information Service to estimate per capita nutrient availability.

Contact: Karen Bunch, Agricultural Economist - 202/786-1870

Determinants of Food Consumption and Dietary Practices. ERS conducts research on factors that influence consumer demand for major food products and individual food items. Socioeconomic factors that are analyzed include regional population shifts, increasing life expectancy, rising incomes, declining birth rates, and health and nutrition concerns. This information is useful for projecting demand for food as demographic characteristics of the population change.

Contact: Richard C. Haidacher, Leader, Food Demand Research Section -
202/786-1862

Effects of Government Policy on Food Consumption and Human Nutrition. An ongoing research activity for ERS is analysis of the effects of Government policies, especially food policies, on both producers and consumers. This research provides insight as to the effects of existing and alternative food and agricultural policies on food consumption, dietary levels, and the nutritional status of target populations. Government policies analyzed include the food assistance programs and policies regulating the safety and quality of the food supply.

Contact: Masao Matsumoto, Agricultural Economist - 202/786-1789

4. Food and Nutrition Service, Robert E. Leard, Administrator

The Food and Nutrition Service (FNS) conducts applied human nutrition research focusing on its food assistance programs (Food Stamp, National School Lunch and Breakfast Programs; the Supplemental Food Program for Women, Infants and Children, etc.). Past research efforts have included evaluations of FNS program impact and nutrition education activities.

Contact: Michael J. Wargo, Director, Program Evaluation Staff, Office of Analysis and Evaluation - 703/756-3117

5. Human Nutrition Information Service, Laura S. Sims, Administrator

The Human Nutrition Information Service (HNIS) conducts and interprets applied research in food and nutrition (1) to improve professional and public understanding of food consumption by U.S. households and individuals, of the nutritive value of foods and of the nutritional adequacy of diets and food supplies and (2) to develop other knowledge needed to improve the quality of diets. Research activities are in four general areas:

Nutrient Data Research. HNIS provides accurate, up-to-date, and comprehensive information on the nutrient composition of all foods important in American diets. This involves gathering and evaluating nutrient data from literature and from Government, university, industry, and other laboratories, and generating data not found elsewhere through sponsorship of extramural research. Data are processed through a computerized National Nutrient Data Bank and disseminated in machine-readable and published form. The Agency also cooperates with other countries and international organizations in developing procedures for the interchange of information on the nutrient content of foods.

Contact: Frank N. Hepburn, Chief, Nutrient Data Research Branch, Nutrition Monitoring Division - 301/436-8491

Food Consumption Research. HNIS plans, coordinates, oversees, and analyzes information from the decennial Nationwide Food Consumption Surveys (NFCS), related supplemental surveys, and methodological research for these surveys. As part of the NFCS system, HNIS conducts a Continuing Survey of Food Intakes by Individuals (CSFII). This survey monitors the nutritional quality of diets between the large decennial surveys. Surveys are designed to give special attention to diets of the low-income population. Survey results are provided in forms readily applicable to multiple policy and program uses relating to

agriculture, food assistance intervention, food quality and regulation, and nutrition education. NFCS provides comprehensive information in published and machine-readable forms on household food use, food cost, and socioeconomic variables as well as on food intakes and dietary practices of individual household members. HNIS staff and staff from the Department of Health and Human Services (DHHS) jointly develop and implement the National Nutrition Monitoring System (NNMS).

Contact: Robert L. Rizek, Director, Nutrition Monitoring Division -
301/436-8457

Diet Appraisal Research. HNIS conducts and interprets food and nutrition research to identify issues and to provide a research basis for decisions made by Government policymakers, educators, health professionals, and consumers to improve the nutritional quality of American diets. Examples are:

- o Maintain USDA's historical series on the nutrient content of the national food supply and assess trends in nutrient availability and food sources of nutrients since the beginning of the century.
- o Keep current the USDA Family Food Plans which are designed to meet nutritional and acceptability criteria at four cost levels. Costs for foods in the food plans are estimated monthly. One of these food plans, the thrifty food plan, is the legal standard for benefits in the Food Stamp Program.
- o Conduct research, using data from HNIS' food consumption surveys, to increase understanding of the dietary status of the U.S. population and the factors associated with dietary status. Analysis focuses on the relationships between food choices, eating patterns, and nutrient intakes and on the personal, health-related, socioeconomic and demographic factors that may affect these relationships.

Contact: Frances J. Cronin, Chief, Diet Appraisal Research Branch, Nutrition Education Division - 301/436-8470.

Guidance and Education Research. HNIS develops and evaluates nutrition guidance concepts, materials, and techniques for increasing nutrition knowledge of professionals and consumers and improving food selection. Examples are:

- o Coordinate the review and revision of the USDA/DHHS Dietary Guidelines for Americans.
- o Conduct research basic to dietary guidance development in food selection, food money management, and food preparation and storage in homes and institutions.
- o Design and evaluate nutrition education approaches appropriate to different audiences, such as print materials to help the household food manager apply the Dietary Guidelines for Americans in food selection and preparation and computerized systems and data bases for use by nutrition professionals and consumers.

- o Conduct and assess research to develop nutrition education concepts. This includes determining the educational needs of different population groups and the most effective methods of meeting these needs.

Contact: Carole A. Davis, Chief, Guidance and Education Research Branch,
Nutrition Education Division - 301/436-5194

6. Office of International Cooperation and Development, Joan S. Wallace, Administrator

The Office of International Cooperation and Development (OICD) supports international research projects in the United States and overseas on food and agriculture, including human nutrition. Using funds from the Agency for International Development and international organizations, OICD also provides technical assistance and training to developing countries. Some of those efforts focus on human nutrition.

OICD's human nutrition activities in developing countries include (1) applied research and technical assistance to increase the availability of nutritious and inexpensive processed foods, such as weaning food supplements and fortified foods; (2) help in making food consumption and nutrition issues a part of agricultural programs and policies; and (3) administration of foreign agricultural research paid for with U.S.-owned foreign currencies. Some 36 grants have been made for overseas research on human nutrition.

Contact: Paul R. Crowley, Chief, Food Technology Branch - 202/447-9206

B. Food and Nutrition Information and Education Agencies

1. Agricultural Marketing Service, J. Patrick Boyle, Administrator

The Agricultural Marketing Service's (AMS) role in developing grade standards, specifications for commodity purchases, and guidelines for commodity promotion programs requires understanding of USDA's dietary guidance recommendations.

Changes in AMS-directed activities must take into account research data as well as the direction of the Dietary Guidelines for Americans. Some educational materials developed by food industry groups for commodity promotion programs are reviewed by the Human Nutrition Information Service for compliance with the Dietary Guidelines.

2. Cooperative State Research Service, John P. Jordon, Administrator

The Higher Education Programs (HEP) staff awards institutional grants on a competitive basis to support graduate training in food science and human nutrition at the predoctoral level. This Competitive Graduate Fellowship Program was initiated in FY 1984 to increase the supply of professionally trained scientists with expertise in food science and human nutrition and to provide for the recruitment of outstanding masters' and doctoral students in these areas.

The supply of professionally trained scientists with expertise in food science and human nutrition is very low and the unmet demand for their services is high.

Many members of the scientific community have repeatedly warned of a shortage of scientists capable of sound food and nutrition research and education.

Contact: K. Jane Coulter, Director, Higher Education Programs - 202/447-7854

3. Extension Service, Myron D. Johnsrud, Administrator

Extension Service has a major responsibility for providing useful and practical information to people of the United States. The Cooperative Extension System (CES) provides outreach to every county in the nation and 16 percent of its total resources are directed to improving health, nutrition, and safety. Research-based knowledge in nutrition, food science, and food safety principles and concepts are provided through the educational programs of the CES. Professionals, paraprofessionals, and trained volunteers deliver food and nutrition programs based on national priorities and designed to meet local needs. They teach clientele improved decisionmaking and resource management; assist them to gain knowledge and skills; and alert them to pertinent applied technology and new research findings. Paraprofessional aides target low-income families in Extension's Expanded Food and Nutrition Education Program teaching them principles of nutrition and how to use limited food resources to improve family diets. CES education programs for youth promote better health through knowledge of nutrition and prevention of nutrition-related health problems. The overall program focus is aimed at educating the U.S. population at the grassroots level.

The main program goals are:

- o Improving nutrition practices through education on nutrition principles, dietary guidelines, human development and lifestyle, and management of food selection, preparation, preservation and storage.
- o Using the most effective and efficient methodology to target and teach a culturally and educationally diverse population.
- o Maintaining up-to-date knowledge base that is readily available, objective, relevant and credible, based on research from the areas of human nutrition, food safety, and health.
- o Informing the public about U.S. agriculture, and the essential interrelationships within the food system from production through consumption underlying the health, safety and good nutrition of the American people.

Contact: Ava D. Rodgers, Deputy Administrator, Home Economics and Human Nutrition - 202/447-2908

4. Food and Nutrition Service, Robert E. Leard, Administrator

Although the primary mission of the Food and Nutrition Service (FNS) is to administer the Federal food assistance programs, it does provide food and nutrition information to selected audiences through (1) technical assistance to State and local FNS program cooperators, (2) food and nutrition informational materials for FNS program participants, and (3) two grant programs to State agencies to conduct nutrition education.

Nutrition and Technical Services Division. The Nutrition and Technical Services Division (NTSD) provides technical support to FNS programs in the areas of nutrition science, nutrition education, food service management, and food science/technology. Nutritionists and food technologists at the Agency headquarters and regional offices provide coordinated assistance and information to State and local agencies administering FNS programs. NTSD also participates in cooperative activities with related agencies, educational organizations, industry and other groups.

Nutrition Education and Training Program. Under the Nutrition Education and Training (NET) Program, funds are granted to States for the dissemination of nutrition information to children and for inservice training of teachers and food service personnel. The program's major goals are:

- o To encourage good eating habits and teach children the relationship between food and health.
- o To train food service personnel in nutrition and food service management and to encourage the use of the cafeteria as an environment for learning about food and nutrition.
- o To instruct educators in nutrition and nutrition education methods and in the use of the cafeteria as a learning laboratory.
- o To develop appropriate educational materials and curricula.

The program is for all children in public and private schools and in residential and nonresidential child care institutions. Through the program, the Department of Agriculture hopes to lay a strong foundation for community involvement in nutrition education and to contribute to general consumer awareness of the relationship between proper nutrition and health.

Contact: Joseph E. Shepherd, Director, Nutrition and Technical Services Division - 703/756-3554

Special Supplemental Food Program for Women, Infants and Children. State and local agencies administering the Special Supplemental Food Program for Women, Infants, and Children (WIC) provide participants with selected foods and nutrition education. This nutrition education is designed to have a practical relationship to participants' nutritional needs, household situation, and cultural preferences; and includes information on how participants can select food for themselves and their families. The goals of WIC nutrition education are to teach the relationship between proper nutrition and good health, to help the individual at nutritional risk develop better food habits, and to prevent nutrition-related problems by showing participants how to best use their supplemental and other foods. The WIC Program also encourages breast-feeding and counsels pregnant women on its nutritional advantages.

Contact: Patrick Clerkin, Director, Supplemental Food Programs Division - 703/756-3746

5. Food Safety and Inspection Service, Donald Houston, Administrator

The Food Safety and Inspection Service disseminates information about nutrition as well as food safety. Recently, they established a toll-free hot line to be used by consumers with specific or general questions relating to meat and poultry.

Information and Legislative Affairs Staff. The Information and Legislative Affairs Staff (ILA) operates the toll-free Meat and Poultry Hotline which answers food safety questions from consumers, businesses, government officials, the media and educators. Calls about nutrition topics are referred to HNIS, ES or other appropriate sources. The hotline is helping to reduce food poisoning cases, providing research to target educational efforts, and keeping decisionmakers informed. These will continue to be the objectives of the hotline as it provides answers to immediate questions while also working to prevent future problems.

ILA also writes and distributes articles and publications on nutrition which are approved by the USDA Dietary Guidance Working Group. These include "Sodium Counting Down," "Do Yourself a Flavor," "Protein--A User's Guide," and "The Fat Machine."

Contact: Laura Fox, Chief, Public Awareness Office - 202/447-9351

6. Human Nutrition Information Service, Laura S. Sims, Administrator

The Human Nutrition Information Service (HNIS) provides information for professionals and consumers from its applied research on the nutritive value of foods; food consumption behavior; food selection; preparation and storage; food money management; and food guides and dietary guidelines for health promotion. Most food and nutrition information from HNIS is published and sold by the Government Printing Office and the Consumer Information Center or prepared in machine-readable form for sale by the National Technical Information Service. In addition, the Agency--

- o Coordinates the publication and promotion of the USDA/DHHS Dietary Guidelines for Americans.
- o Provides leadership in the Dietary Guidance Working Group to ensure that dietary guidance from USDA conforms to the Dietary Guidelines for Americans, is supported by research-based knowledge, and is objective in presentation; to help coordinate USDA dietary guidance activities; and to provide liaison with the Departments of the Federal Government, especially DHHS.
- o Conducts or participates in activities to increase awareness by professionals and the public of HNIS food and nutrition education materials. Examples of activities are food editors conferences, television and radio shows, and exhibits at professional meetings.
- o Participates in Interagency Committee for Human Nutrition cooperative efforts (1) to conduct departmental and interagency nutrition education and information projects and campaigns; (2) to identify nutrition education

research needs by USDA agencies and collaborate on such research; and (3) to increase visibility of agency USDA products and services within and outside the Department.

- o Cooperates with the private sector in the preparation of materials for the public.

Contact: Susan O. Welsh, Director, Nutrition Education Division -
301/436-5090

7. National Agricultural Library, Joseph H. Howard, Director

The National Agricultural Library maintains a Food and Nutrition Information Center (FNIC) with its 35,000 volume collection. This Center constitutes a major subfile of AGRICOLA, the library's bibliographic online database. The scope of the collection is constantly expanded to assure coverage of all aspects of food and nutrition. FNIC serves as the national repository for nutrition education materials developed for the USDA's Nutrition Education and Training (NET) Program and the Supplemental Food Program for Women, Infants, and Children (WIC). FNIC also serves as a national demonstration center for food and nutrition microcomputer software.

FNIC provides lending services of both print and audiovisual materials to the following groups of patrons:

The U.S. Congress
Federal government agencies
State government agencies
Libraries, information centers
Universities, colleges
Cooperative Extension
Research institutions
Professional societies
School districts and individual schools, including
 food service personnel and teachers
Nutrition Education and Training Program staffs
Head Start personnel
Day care personnel
Supplemental Food Program for Women, Infants and Children (WIC)
 and Commodity Supplemental Food (CSF) Program personnel

Reference and referral services including computer online retrieval of information are available to professionals and other interested persons.

Food and nutrition information is further disseminated through national networks FNIC has established with state school food service personnel, state WIC nutrition educators, and school nurses.

FNIC was a recipient of the 1986 John Cotton Dana Library Public Relations Award. This award was based on FNIC's dissemination program to Food and Nutrition Service program personnel and clientele.

Contact: Robyn C. Frank, Chief, Food and Nutrition Information Center -
301/344-3719

8. Office of Information, John M. McClung, Director

The Office of Information, as part of the Office of Government and Public Affairs, is responsible for maintaining the flow of information and providing liaison between USDA and the mass communication media and the public at large. The office directs and coordinates public affairs/public information work with the various agencies, including those with responsibility for nutrition and nutrition-related information. The office has final review of all national news releases, broadcast materials, publications, visuals, and other information materials involving departmental policy. It provides leadership and facilities in the production of radio and video tapes, film, still photography, exhibits, and other materials. The office coordinates and maintains a Departmental electronic food and nutrition information service for internal and public use.

Electronic Food and Nutrition Information Service. In April 1986, USDA launched the Food and Nutrition Information Service as part of USDA ONLINE, the Department's electronic information service on the Dialcom computer system.

The new Service, which is available to USDA and other government and non-government users of USDA information, carries "consumer" oriented, and generally non-technical, information on nutrition and related food research; basic human nutrition and diet; post harvest and food marketing; food economics and costs; food assistance programs; and food safety.

Included are current news items, bibliographies, and publication lists; regularly issued materials; entire texts of publications (i.e., Nutrition and Your Health: Dietary Guidelines for Americans); brief descriptions and information contacts of USDA agencies with nutrition and nutrition-related responsibilities; and information developed specifically for the electronic service.

Contact: Lillie Vincent, Public Affairs Specialist, Office of Information,
202/447-8157

C. Food Assistance Agency

1. Food and Nutrition Service, Robert E. Leard, Administrator

The mission of the Food and Nutrition Service (FNS) is to provide access to a more nutritious diet for persons with low incomes and to encourage better eating patterns among the Nation's children. The 10 programs that FNS administers and contacts for more detailed information follow.

Food Stamp Program. The Food Stamp Program helps needy households purchase the foods they need for good health. Participating families get free coupons, which they exchange for food at authorized stores. The value of the coupon depends on a household's size and financial circumstances. Food stamps supplement what a family spends on food. People apply for food stamps at their local social services office. In addition to qualifying on the basis of income, families and individuals must meet work registration requirements, maximum resource requirements, and certain citizenship and residency requirements.

Contact: John Stokes III, Deputy Administrator, Family Nutrition Programs -
703/756-3026

Special Nutrition Programs

Contact: George Braley, Deputy Administrator, Special Nutrition Programs -
703/756-3052

- o Special Supplemental Food Program for Women, Infants, and Children. The Special Supplemental Food Program is commonly known as WIC. It provides nutritious food supplements to pregnant, breast feeding, and postpartum women, as well as to infants and children up to the sixth birthday. WIC is operated by local health clinics and other authorized health facilities. WIC benefits are currently provided by approximately 7,500 clinics throughout the country. To qualify, mothers and children must be individually certified as "nutrition risks" because of dietary need and inadequate income. Each participating mother or child receives individually prescribed packages of foods high in protein, iron, calcium, vitamin A, and vitamin C. Depending on the age and nutrition needs of the woman, infant, or child, the package includes such foods as iron-fortified cereal, eggs, juice, and either milk or fortified infant formula or cheese. In some areas, peanut butter or dry beans or peas may also be provided. Participants receive nutrition education along with the supplemental foods (see Section II.B.). WIC clinics provide supplemental foods in one of three ways. They obtain foods from local firms and distribute them directly; they arrange for home delivery; or they give mothers vouchers to exchange for specified items at authorized grocery stores. Most clinics give participants vouchers.
- o Commodity Supplemental Food Program. The Commodity Supplemental Food Program (CSFP) distributes USDA-donated foods to low-income women and children certified by participating local health agencies. Those eligible include infants, children up to age 6, pregnant or breast-feeding women, and low income and senior citizens vulnerable to malnutrition. To take part in the CSFP, women and children must qualify for benefits under an existing Federal, State, or local food, health or welfare program for low-income people. Some State agencies also require that participants be determined to be at nutritional risk by a doctor or staff person at the local agency. Participants get prescribed food items, which they pick up at a distribution facility. They also receive instruction on how to prepare foods and practical lessons on nutrition. The CSFP is currently operated by 28 local health agencies in 13 States.

Contact: Patrick Clerkin, Director, Supplemental Food Programs Division -
703/756-3746

- o Food Distribution Programs. Through the Food Distribution Program, USDA purchases surplus foods from U.S. markets and distributes them to State agencies for use by eligible local agencies. The foods go to schools and institutions participating in the child nutrition programs, to nutrition programs for the elderly; to needy families on Indian reservations, to hospitals and prisons; and to charitable institutions, food banks, hunger centers, soup kitchens, and similar non-profit organizations providing nutrition assistance to relieve situations of emergency and distress.

The foods are also used to help victims of natural disasters. The largest percentage of USDA-donated foods goes to schools. Currently, schools get 70 percent of the foods donated by USDA.

Contact: Alberta Frost, Director, Food Distribution Division - 703/756-3680

- o Child Care Food Program. The Child Care Food Program helps child care facilities and institutions serve nutritious meals and snacks to preschool and school-aged children. To participate, facilities and institutions must be licensed or approved to provide child care services. They must also meet certain other eligibility requirements. The program operates in nonresidential day care centers, settlement houses, outside-school-hours care centers, family day care homes, institutions providing day care for handicapped children, and others. Participating facilities and institutions get cash assistance, USDA-donated foods, and technical guidance. In child care centers, the amount of cash assistance varies according to the family size and income of children served. In day care homes, the amount of cash assistance is based on a food service payment rate.
- o Summer Food Service Program. The Summer Food Service Program for Children helps communities serve meals to needy children when school is not in session. The program is sponsored by public or private nonprofit school food authorities or local, municipal, county, or State governments. Public or private nonprofit residential camps also may be sponsors. The program operates in areas in which at least 50 percent of the children served by the site meet the income criteria for free or reduced-price school meals. USDA reimburses sponsors for operating costs of food services up to a specified maximum rate for each meal served. Higher administrative rates are provided to rural area to encourage their participation in the program. In addition, sponsors receive some reimbursement for planning, operating, and supervising expenses.
- o National School Lunch and School Breakfast Programs. The National School Lunch and School Breakfast Programs help schools serve nourishing low-cost meals to children. In addition to cash assistance, participating schools get USDA-donated foods and technical guidance. Payments to schools are higher for meals served to children who qualify on the basis of family size and income for free or reduced-price meals.
- o Special Milk Program. The Special Milk Program for Children makes it possible for all children attending a participating school or institution to purchase milk at a reduced price or, if they are eligible, receive it free. Reimbursement is provided for each half-pint of milk served under the program. Schools and institutions that participate in other Federal-State child nutrition programs may not participate in the Special Milk Program for Children.

Contact: Samuel Bauer, Director, Child Nutrition Division - 703/756-3590

- o Program Research and Evaluation. The Food and Nutrition Service conducts research on, and evaluation of, its programs.

Contact: Anna Kondratas, Director, Office of Analysis and Evaluation - 703/756-3017.

D. Food Inspection, Marketing, and Procurement Agencies

1. Agricultural Marketing Service, J. Patrick Boyle, Administrator

The Agricultural Marketing Service (AMS) develops quality grade standards and provides voluntary grading services for meat, poultry, eggs, dairy products, rabbits, fruits, vegetables, cotton, tobacco, wool, mohair, and livestock. It also has responsibility for administration of marketing regulatory programs, marketing agreements and orders, research and promotion programs, market research and development, mandatory egg products inspection, and buying programs that provide foods for USDA food assistance programs.

This last area of responsibility affects human nutrition. AMS purchases meat, poultry, egg products, fish, nuts, and fruits and vegetables for domestic feeding programs. When AMS writes the specifications for these commodities, consideration is given to nutrition. For example, the fat content of ground beef is no more than 22 percent, minimum salt and other additives are used in processed products, and only lightly sweetened fruit products are considered.

Considerations are based on recommendations from other USDA agencies. The goals are twofold and interrelated in this purchase program--to cut down on waste and to assure palatability. A certain level of acceptance of the product must be considered to ensure consumption. If a product is unacceptable, it will not be consumed.

Contact: Eddie F. Kimbrell, Deputy Administrator, Commodity Services, 202/447-5231

2. Agricultural Stabilization and Conservation Service, Milt Hertz, Administrator

The Utilization Branch, Agricultural Stabilization and Conservation Service (ASCS), develops and maintains specifications for commodities procured by the Kansas City Commodity Office of ASCS that are intended for human consumption.

Contact: Ronald L. Wilson, Chief, Utilization Branch, Commodity Operations Division - 202/447-5647

3. Food Safety and Inspection Service, Donald L. Houston, Administrator

The Food Safety and Inspection Service (FSIS) safeguards nutritional quality of meat, poultry, and meat and poultry products through inspection and analysis and through establishment of standards, approval of labels, and monitoring of the industry for compliance with inspection laws.

Chemistry Division, Science Program. The Chemistry Division is responsible for developing the most economically feasible and improved analytical chemical methods with increased capacity, greater sensitivity, and accuracy to determine the presence of environmental contaminants and drug residues for inclusion in the ongoing Science Program. The staff also determines the presence of food additives and the nutritional value of meat and poultry products. This responsibility has both national and international significance, since domestic and imported or exported meat and poultry products are analyzed. The Division:

- o Manages the Accredited Laboratory Program designed to increase the effectiveness of the field inspection program; conducts a quality assurance program to assure continuous acceptable quality of analytical work.
- o Participates in reviewing submitted technical information to assess its accuracy and validity. Provides professional development and training in existing and newly developed chemical methods and techniques.
- o Participates with FDA to evaluate residue analytical procedures with each New Animal Drug Application (NADA).

Contact: R. L. Ellis, Director, Chemistry Division or G. R. Heavner, Deputy Director, Chemistry Division - 202/447-7623

Food Ingredient Assessment Division, Science Program. The Food Ingredient Assessment Division (FIAD) provides analytical, consultative, and planning services in the areas of food ingredients, nutrition, and product safety. The Division serves as the FSIS information source on nutrition, food science and product safety, and as the coordination unit for formulation of FSIS nutrition policy. The Division performs work of national and international significance, involving imported, exported, and domestic meat and poultry products. The Division:

- o Plans and coordinates projects to sample and assess ingredients, nutrients and other constituents, either added to or naturally present in meat and poultry products.
- o Coordinates the development of nutrition policy with other Agencies and Departments, by participating on committees to address such issues as public health messages on labels, nutrition claims, and national nutrition education programs.
- o Coordinates research projects on nutrition and food science topics with other agencies and departments.
- o Serves on the departmental Dietary Guidance Working Group and provides nutrition evaluations and clearances as needed.
- o Plans and coordinates health, safety and exposure assessments of selected components of meat and poultry products and conducts food consumption studies.

- o Computerizes generic formulations for meat and poultry products.
- o Manages bacon monitoring program for nitrosamines and special cured meat studies involving analysis of nitrosamines.
- o Develops a database for protein quality values of ingredients used in meat and poultry products.

Contact: B. Wells Willis, Chief, Nutrition Branch - 202/447-7625

- o Conducts approximately 11,000 paper evaluations per year of packaging materials, chemical compounds, and direct and indirect food additives used for foods regulated by FSIS to determine if they meet established safety requirements. Evaluation of nonfood compounds and direct and indirect food additives prior to their use is mandatory.
- o Develops and disseminates information about additives and nonfood compounds. Develops criteria to formulate agency policy on the use of these substances in meat and poultry establishments.

Contact: Charles Edwards, Chief, Product Safety Branch - 301/344-2566

- o Develops recommendations for regulations, bulletins and other documents to implement Agency standards for food irradiation.
- o Coordinates the development and implementation of food irradiation dosimetry systems.
- o Develops and maintains a computerized database of food irradiation information in cooperation with the National Agricultural Library.
- o Evaluates food constituents and nonfood compounds to determine the toxicological hazard involved in their intended use. This activity is coordinated with FDA and EPA in areas where those agencies also have authority.

Contact: Donald D. Derr, Director, Food Ingredient Assessment Division, or Linda P. Posati, Deputy Director, Food Ingredient Assessment Division - 202/447-7680

Standards and Labeling Division, Meat and Poultry Inspection Technical Services Program. The Standards and Labeling Division carries out the Department's label approval and auditing function for all labels that are used on federally inspected meat and poultry products. The Division reviews all complex labeling prior to its use on meat and poultry and monitors those labels that are approved in the field. The Division conducts reviews to ensure that meat and poultry products are formulated with safe and suitable ingredients, that their labels are truthful and not misleading, and that those labels show all required information. Formal product standards are developed to specify meat content and/or usual ingredients of meat and poultry products when industry members or consumers show particular interest in increasing uniformity among products using the same product name. Development of rules to permit or restrict the uses of various food additives is the responsibility of this office. Other regulations

in the food labeling area are also developed by the Division, and the Division provides support and advice relating to assigned activities of Codex Alimentarius.

Contact: M. Glavin, Director, Standards and Labeling Division - 202/447-6042 or
K. Steele, Deputy Director, Standards and Labeling Division -
202/447-4293.

For additional information about any of the preceding activities, please contact the respective person indicated.

III. USDA RESEARCH PROGRAM IN FOOD AND HUMAN NUTRITION

The major responsibility for ensuring that national food and human nutrition research needs are met rests with the Agricultural Research Service, the Human Nutrition Information Service, and the Cooperative State Research Service. The Economic Research Service, the Food and Nutrition Service, and the Office of International Cooperation and Development also conduct some research related to human nutrition. In addition, the Department administers an extramural program of human nutrition research through the Competitive Research Grants Office.

The human nutrition research activities within the USDA are coordinated through the Department's Subcommittee for Human Nutrition of the Research and Education Committee of the Secretary's Policy and Coordination Council. Nutrition research at the national level is coordinated through the Interagency Committee on Human Nutrition Research, co-chaired by the Assistant Secretary of Science and Education, USDA, and the Assistant Secretary for Health, DHHS. Also, the computerized data base of ongoing Federal food and human nutrition research recently developed (Human Nutrition Research Information Management System) greatly facilitates the rapid exchange of unpublished research information between agencies.

The USDA research programs in Food and Human Nutrition consist of the following six areas of research:

- o Normal human requirements for nutrients
- o Energy metabolism and role of nutrients in health promotion
- o Food composition and bioavailability of nutrients
- o Food and nutrition monitoring research
- o Food and nutrition information and education research
- o Research on effects of government policy and socioeconomic factors on food consumption and human nutrition

Using the Human Nutrition Research Information Management System (HNRIMS), a computer search by nutrition codes was made of the 1188 USDA research projects in the system, August 21, 1986. The results are given in table 1. This table lists the number of USDA projects in each category under each of the six research areas listed above. In addition, it shows the percentage of the total number of the USDA projects that were coded for each of the categories. The table also gives the percentage of the total number of research projects in HNRIMS for all Federal agencies represented by the USDA projects, by category.

Table 3, Section V lists a similar, but not identical, classification of projects by level of funding rather than number of projects. The grouping shown in table 1 was selected to permit the maximum use of HNRIMS and to show the relationship of the USDA food and nutrition research program with the "Human Nutrition Research: The Federal Five-Year Plan" prepared by the Interagency Committee on Human Nutrition Research. The Federal Five-Year Plan lists six areas as focal points for human nutrition research. These are:

Table 1

USDA Research in Human Nutrition
(from HNRIMS, 21 August 1986)

<u>HNRIMS Nutrition Code Area</u>	<u>USDA Projects*</u>		<u>USDA Projects</u>
	<u>Number</u>	<u>%</u>	<u>% of Federal Research in Area</u>
<u>Normal Human Requirements for Nutrients</u>			
1. Maternal	62	5	32
2. Infant and Child	71	6	17
3. Adolescent	29	2	40
4. Adult	63	5	56
5. Elderly	55	5	27
13. Nutrition and Function	97	8	21
14. Nutrient Interactions	179	15	35
<u>Energy Regulation and Role of Nutrients in Health Promotion</u>			
6. Cardiovascular Disease and Nutrition	72	6	16
7. Cancer	40	3	6
8. Other Diseases (Osteoporosis, Diabetes)	57	5	14
11. Obesity, Anorexia and Appetite Control	38	3	12
17. Carbohydrates	81	7	35
18. Lipids	170	14	28
20. Proteins and Amino Acids	179	15	37
21. Vitamins	134	11	18
22. Minerals and Trace Elements	203	17	39
24. Fiber	48	4	51
<u>Food Composition and Bioavailability of Nutrients</u>			
26. Food Composition	330	28	83
27. Bioavailability of Nutrients	149	13	65
28. Effects of Technology on Nutritional Characteristics of Food	402	34	92
29. Other Food Science Research	241	20	92
<u>Food and Nutrition Monitoring Research</u>			
16. Nutritional Status	168	14	30
30. Food Consumption Surveys	54	5	64
31. Dietary Practices, Food Consumption Patterns	109	9	50
<u>Food and Nutrition Information and Education Research</u>			
32. Methods for Informing Public About Nutrition	29	2	22
33. Other Nutrition Education Research	9	1	31
<u>Effects of Gov. Policy and Socioeconomic Factors</u>			
34. Effects of Gov. Policy and Socioeconomic Factors on Food Consumption and Nutrition	60	5	86

*Numbers are not additive as projects may be assigned more than one nutrition code (1,188 USDA research projects in system).

- o Nutrient requirements throughout the life cycle
- o Nutrient content, bioavailability and interactions
- o Research on the role of nutrients in the etiology, prevention and treatment of chronic diseases and conditions
- o Energy regulation, obesity, and related eating disorders
- o Nutrition monitoring research
- o Research in nutrition education

The USDA research program in food and nutrition fits well into the Federal plan, except for the research on Effects of Government Policy and Socioeconomic Factors on Food Consumption and Human Nutrition. This is considered to be necessary research for USDA because it funds and administers food assistance programs. The USDA program does not include research on the role of nutrients in the treatment of chronic diseases or disorders, even though they may be diet related. It does, however, fund some research on health promotion or prevention of nutrition-related disorders, as a part of studies on the role of fats, carbohydrates, fiber and other components of foods and diets. The USDA food and nutrition research program places heavy emphasis on normal human requirements for nutrients and composition and bioavailability of nutrients in foods.

The USDA food and human nutrition research that will be continued or initiated during the next 5 years (FY 1987-92) is listed by area below.

A. Normal Human Requirements for Nutrients

Considerable information is available on human needs for energy and many essential nutrients by ages and sex. Where the data are adequate, most of this information is being used in improving health, in providing better nutritional guidance, in preparing more nutritious foods, and in providing better nutrition for those most at risk.

Progress in our knowledge about diet and our awareness of what we need from our foods is readily apparent. About 45 years ago, pellagra was shown to be a deficiency of niacin, a member of the vitamin B complex. The same year, the Nobel Prize was awarded for the discovery of the nutrient which could cure scurvy. Forty years ago, the enrichment of white flour was initiated under a War Food Order of the U.S. Government and for 25 years the major nutritional deficiency diseases have been nonexistent in the United States and Canada. Indeed, nutrition knowledge, and food technology and distribution, were so successful in eradicating the more overt deficiencies, that nutrition teaching and research were relegated to second place in most medical schools.

Nutrition was easier to interpret to scientists and to laymen in the era of major nutritional deficiency diseases. Then, nutritional knowledge seemed to be either black or white. Unfortunately, this is no longer true. We now are

increasingly concerned with more elusive aspects, such as effects of diets on our intellect, our heart, our performance, postponement of onset of chronic debilitating diseases, and our life span. More information is needed about the relationship between nutritional state and the degree to which we achieve our genetic potentials. Some of the genetic potentials influenced by nutrition are growth, weight maintenance, intellectual development, reproduction, capacity for physical work, behavior and immune functions. The thresholds for adverse effects for most nutrients are ill-defined; thus marginal deficiencies or marginal toxicities are poorly understood. Similarly, the effects of positive and negative interactions of nutrients in foods as eaten and their consequences for development of adequate daily eating plans require special attention.

The scientific data available even for adults, were deemed insufficient to permit the establishment of a recommended dietary allowance in the 9th Edition of the RDAs for three vitamins (vitamin K, pantothenic acid and biotin) and several minerals (copper, chromium, fluoride, manganese, molybdenum, and selenium). Estimated safe and adequate levels were suggested instead. Other nutrients of importance in foods for which even less information is available are nickel, vanadium, silicon, arsenic, cobalt, linolenic acid, linoleic acid, taurine, carotene, and the components of dietary fiber.

Even for those nutrients for which RDAs have been established, information is needed about the individual variability in requirements for essentially all nutrients. For the elderly, requirements have been based largely on extrapolation from adult age groups and less is known about the nutrient needs during adolescence than during any other life cycle stage. Even where RDAs exist, data for many areas are far less complete than is needed.

The Joint Nutrition Monitoring Evaluation Committee in its report of July 1986 on "Nutrition Monitoring in the United States" assessed the completeness of available data for food components as follows:

- o Food components for which data were the most complete: food energy, protein, vitamin ~~K~~_A, vitamin C, and iron.
- o Food components for which data were less complete: thiamin, riboflavin, niacin, vitamin B-6, vitamin B-12, calcium, and phosphorus.
- o Food components for which data were the least complete: fat, fatty acids, cholesterol, carbohydrates, added caloric sweeteners, fiber, folacin, magnesium, sodium, and zinc.

Food components requiring further investigation listed included fiber, vitamin B-6, folacin, magnesium, and zinc.

Dietary studies show that the intakes of folacin, pyridoxine, zinc, magnesium, iron, and calcium fall below 70 percent of the Recommended Dietary Allowances for women, regardless of income level or race.

1. Maternal Nutrition

a. Nutritional requirements of pregnant women (ARS, CSRS)

Nutritional studies in pregnancy will cover the period from conception through the first year of life. This period in human development is the most sensitive

to dietary inadequacy. The investigation of the nutritional requirements during pregnancy is part of the Children's Nutrition Research Center mission. Nutritional status during pregnancy relates directly to many nutrition action programs in this country and abroad. The partitioning of maternal dietary nutrients into the needs of the mother and those of the fetus will require basic studies. Nonradioactive stable isotopes will be used as markers for the study of nutrient transfer from the maternal diet to the fetus in humans. Many of the experimental designs have been tested previously in animal studies. Knowledge of the quantitative dietary needs of this population (especially protein, amino acids and energy) will contribute to the definition of human nutrient requirements and to a more precise statement of food needs. Studies will focus on energy, protein, amino acids, essential fatty acids, calcium, zinc, iron, folacin, and pyridoxine requirements.

b. Nutritional requirements of lactating women (ARS, CSRS)

The specific objectives are (1) to develop sensitive, easily applicable criteria (not dependent exclusively on growth performance) that will assess the time at which infants outgrow the ability of most mothers to provide adequate nutrients in an exclusive human milk diet; (2) to develop a model that will assess the functional significance (maturation of gastrointestinal and immune capabilities) of feeding human milk; (3) to evaluate amino acid metabolism in infants fed human milk; (4) to measure energy expenditure of infants; and (5) to assess protein metabolism at various stages of lactation. The results derived from these studies will allow nutrient requirements to be established for infants fed human milk and for lactating women. The compositional characteristics of human milk, metabolic adaptations that enhance efficient nutrient utilization in exclusively breast-fed infants, and factors that control the production of milk also will be studied.

c. Calcium and other mineral requirements during lactation (ARS, CSRS)

This work is designed to expand knowledge about the calcium metabolic and humoral responses of humans to the stress of lactation, and the extent to which nutritional factors may modify these responses; and to assess whether lactation has a measurable influence on parathyroid hormone levels, 25-hydroxyvitamin D levels, bone density and bone cortical area. The intake of calcium, phosphorus, and sodium will receive special attention because of evidence suggesting that these nutrients in human milk may sometimes limit growth and development. Requirements for other minerals also will be studied.

d. Protein/amino acid requirements during lactation (ARS, CSRS)

The objective is to develop methodology applicable in the human for estimating protein and amino acid requirements during lactation. This work will involve the use of stable isotopes (^{13}C and ^{15}N) to determine the amino acid turnover rates, the amount incorporated into newly synthesized protein (including milk protein) and the amount oxidized in lactating and nonlactating women. It is planned to use multicompartmental analysis techniques for the comparative study of the metabolism of specific amino acids in normal, postpartum and lactating women.

- e. Micronutrient requirements of pregnant and lactating women (ARS, CSRS)

Those trace elements (iron, zinc, selenium and copper) and vitamins (folacin, pyridoxine, vitamin C and vitamin A) sometimes consumed at levels below those considered to be adequate will be studied.

- f. Nutrient transfer to human milk (ARS, CSRS)

The objectives of this work are to develop and test methods using stable isotope tracers to estimate the amount of a dietary component that is incorporated into breast milk; to assess the selectivity of the transport mechanism involved and to identify the precursor blood pools from which the nutrient under study is selected for incorporation into milk. Dietary lipid transfer will be studied first.

2. Infant and Child Nutrition

- a. Nutritional requirements of infants and children (ARS, CSRS)

The mission of the Children's Nutrition Research Center is to define the nutritional requirements that will ensure health in pregnant and lactating women and in their children from conception through adolescence. To accomplish this mission, the Center has established the following objectives: (1) to determine how the diet of a pregnant woman affects the health of the child she delivers; (2) to determine how nutrition of the mother affects lactation and the nutrient content of her milk; (3) to determine the relationship between nutrition and the physical and mental development of infants and children; (4) to define the nutritional needs for healthy growth and development through adolescence; (5) to develop noninvasive methods for the investigation of the nutrient requirements of infants, children, adolescents, and pregnant and lactating women; and (6) to define the biochemical anthropometric and dietary standards for nutritional assessment of infants and children, as well as adolescents, and pregnant and lactating women.

The specific objectives of the Weaning Program of the Center are (1) to determine the effects of nutritional insufficiency on the intracellular content of electrolytes, water, and bound and free amino acids, (2) to evaluate the capacity of young infants to digest and absorb nutrients from various sources, and (3) to identify the mechanism and capacity of the colon to scavenge calories from malabsorbed nutrients, especially from carbohydrates. These studies will provide information needed to establish the nutrient requirements during the weaning period. Essential to the attainment of this goal is an understanding of the functional response of the gastrointestinal tract to foods other than human milk, of maturation of digestive and absorptive capacities, and of the developmental changes in tissue composition when nutrient needs are not met.

Stable isotopes will be used (1) to determine amino acid kinetics in pregnant, postpartum, and lactating women through infusion protocols with multiple stable isotopic forms of the same amino acid; (2) to measure the absorption, bioavailability, transport, and excretion of dietary lipids in the lactating mother and the utilization of milk nutrients by the infant; (3) to measure kinetics of nutrients such as pyridoxine, folacin, biotin, choline and pantothenic acid in pregnant and lactating women and the adequacy of pyridoxine

intake by infants from human milk; (4) to measure the changes in body composition represented by total body water in young infants fed human milk or commercial formulas during the first six months of life; and (5) to determine energy expenditure by free-living infants and children by the dual 0^{18}H^3 isotope technique. The information to be derived from these studies will enable the development of quantitative noninvasive methods for the determination of nutrient requirements.

- b. Protein (amino acids) and energy requirements for growth of infants and young children (ARS, CSRS)

Growth is the unique feature of the period of life investigated by the Children's Nutrition Research Center. Therefore, research will be focused on protein and energy requirements to achieve normal growth and body composition. These investigations will be expanded to include a detailed investigation of the energy cost of growth and the partitioning of nutrients into lean and adipose tissues. Because of limitations in experimental design for the human, collaboration with animal nutritionists will be developed to validate indirect approaches which use stable isotopes and indirect measurements of body composition in the human.

- c. Impact of nutritional status on neuropsychological function and behavior (ARS, CSRS)

Nutrients known to be marginal in many human diets will be assessed for their roles in neuropsychological function. Nutrients of particular interest are iron, zinc, copper, thiamin, riboflavin, pyridoxine, folic acid, and retinol. Initial emphasis will be placed on iron, zinc, and copper. Interactions among the nutrients will be assessed. Studies will be done in animal models to characterize roles of the nutrients in ontogeny of the brain, neuro-transmission, and behavior. Studies in animals will identify residual consequences on behavior of deficiencies of these nutrients during neurogenesis. Studies will be done in humans to characterize effects of mild and moderate deficiencies, and of supplementations on cognition, electrophysiology, and other indices of function at various ages.

A most significant functional consequence of early nutrition is its effect on brain function and behavior. This will be approached from a biological base focusing on the metabolism of lipids and amino acids in the brain. Dietary, psychological and physiological parameters will be related to quantitative biochemical investigations.

- d. Functional significance of human milk feeding (ARS, CSRS)

Preliminary data indicate that infants exclusively fed breast milk from birth to 4 months of age grow and develop normally while consuming substantially less protein and energy than is recommended. These amounts also are less than are actually consumed by bottle fed infants on conventional formulas. This suggests that infants fed breast milk are physiologically satisfied before they consume as much energy and protein as bottle fed infants due to the composition of the breast milk itself. The object of this study is to determine just what changes in composition of infant formulas is necessary to achieve this improved balance. The reduced voluntary intake of the infant may be important in maintaining a

lower body fat content during early growth and development, and thus may reduce the tendency for obesity in later life.

e. Micronutrient requirement of infants and children (ARS, CSRS)

Micronutrient deficiencies are not uncommon in infants and children (i.e., iron, zinc, vitamin A, folic acid) and will receive directed attention. The dietary intakes of critically limiting minerals or vitamins may largely determine the efficiency of utilization of the macronutrients studied. This effort will be increased as additional support becomes available.

f. Nutritional requirements of adolescents (ARS, CSRS)

Adolescence is the time of profound physical transformation. Growth rates during this period are exceeded only by those during fetal development and early infancy. Adolescent nutrition has received very limited attention despite the very high need for calcium, protein, and iron during the growth spurt, especially for males. The requirements during this period may be influenced also by physical fitness training, obesity, and pregnancy as well as the growth spurt and sexual maturation. The need for more information about the nutrient needs of pregnant teenagers is urgent, as some 30,000 babies are born annually in the U.S. to adolescents 15 years of age or younger. Areas of research concern will include protein and amino acid requirements, energy regulation and prevention of obesity, and adequate intakes of calcium, iron, zinc, folacin, pyridoxine, and vitamin A. This important area of study will be expanded as funds become available.

3. Adult Nutrition

a. Mild deficiencies of nutrients (ARS, CSRS)

Physiological and biochemical effects of "subclinical" deficiencies of nutrients that are limiting in many human diets will be assessed under carefully controlled conditions. Research reveals interactions among nutrients that affect absorption, retention, and utilization or have undesirable effects on physiologic function. Examples of functions include neuropsychological, physical performance, carbohydrate metabolism, lipid metabolism, and endocrinologic function. Nutrients of particular interest include zinc, copper, iron, chromium, pyridoxine, riboflavin, folic acid, essential fatty acids, and retinol.

b. Nutrient requirement studies on free-living human subjects (ARS, CSRS)

Using free-living humans fed experimental diets under controlled conditions, USDA Human Nutrition Research Centers are determining human dietary intakes and ranges for energy, protein, carbohydrates, lipids, vitamins and minerals, and bioavailability from commonly eaten foods which will assure optimal function during the life cycle. Development of dietary strategies which can lead to postponement of onset of certain nutritionally related debilitating conditions will be an important objective.

c. Vitamin requirements of adult humans (ARS, CSRS)

The objective of this effort will be to determine the dietary vitamin requirements of humans and to identify and quantitate the effectiveness of the forms in foods that may be useful in meeting these requirements. Examples of such studies are given:

- o Determine the dietary requirement for folic acid, especially in the mature young female, and quantitate the relative effectiveness of the various forms in foods.
- o Determine the dietary requirement of adult humans for vitamin B-6, and quantitate the relative effectiveness of pyridoxine, pyridoxal, and pyridoxamine in satisfying the requirement.
- o Determine the dietary vitamin C requirement of adult humans, with emphasis on the interaction of vitamin C with iron, copper, selenium, pyridoxine, folic acid, vitamin A, vitamin E, and oxalic acid in blood and urine.

d. Dietary requirements for lipids by adult humans (ARS, CSRS)

This research will be designed to determine the level of polyunsaturated fatty acids required in the diet as influenced by total fat level and fatty acid composition of the fat. Preliminary results indicate that the ratio of polyunsaturated fatty acids to saturated fatty acids may affect blood pressure, blood lipids and blood clotting, but these effects are not understood. The effects of total fat level and level of saturated, monounsaturated and polyunsaturated fatty acids in the diet will be determined. The requirement for polyunsaturated fatty acids will be determined for both sexes and for different age groups. The metabolism of prostaglandins as related to polyunsaturated fatty acid requirements will be studied.

e. Requirement for trace elements in adults (ARS, CSRS)

- o The basic roles of selenium and vitamin E in human nutrition will be investigated to provide a basis for establishing the physiological need under various conditions, including stress, high fat diets, and other factors.
- o Studies also will be conducted on the metabolic role of chromium in adults. A role of chromium in carbohydrate homeostasis has been discovered and will be explored further. Improved methodology will be developed involving stable isotopes to measure trace element status and requirements.
- o Anatomical consequences of trace element deficiencies in tissues such as brain, heart, kidney, bone, and pancreas will be characterized. Present knowledge of this subject is severely limited.
- o Studies will be extended to determine the required and safe levels of copper in humans. The possibility that copper intakes may be inadequate to promote optimal health in individuals with high intakes of fructose makes this a priority concern, especially as it relates to cardiovascular disease.

f. Possible need for ultratrace elements (ARS)

Studies with animal models show that nickel, vanadium, arsenic, and boron are dietary essentials under certain conditions. The metabolic role of these

ultratrace minerals will be studied in appropriate animal models to ascertain their roles in metabolism and function. Lead will be evaluated to ascertain its essentiality. Absorption and retention of these elements by humans will be measured by metabolic balance and tracer techniques. Interactions of these elements with other nutrients (calcium, magnesium, and aluminum) will be evaluated chemically and functionally, especially with regard to the parathyroid.

g. Individual differences in energy requirements (ARS)

Studies will be done to determine the individual differences in energy expenditure and in energy utilization efficiency. Factors to be investigated will include the effect of the level of exercise on resting metabolic rate and on food consumption, the effect of body composition on energy intake and balance, and the effect of suboptimal levels of essential nutrients or metabolites on physiological appetite.

4. Nutrition of the Elderly

The appropriateness of the present RDAs for an elderly population is unknown. Micronutrient RDAs for the elderly are mostly simple extrapolations of RDAs used for a younger population. Virtually no studies have been done to determine dietary requirements for people over the age of 75. Studies will be conducted on the nutrient requirements of older adults and on factors or conditions which commonly influence those requirements.

a. Nutrient requirements as affected by absorption and utilization (ARS, CSRS)

Studies will be continued on the effect of aging and associated factors (such as use of medication and reduced gastric acid production) on the absorption and utilization of essential nutrients. These studies will involve folacin, vitamin A, calcium, magnesium, vitamin C, riboflavin, vitamin B-12, and pyridoxine.

b. Effect of physical activity on requirements of elderly (ARS, CSRS)

Investigations will explore the interaction between nutrition, exercise and aging to learn how physical activity affects nutrient requirements and functional capacity in the elderly. The extent to which aging alters the adaptive responses to increased physical activity is largely unknown, particularly as it affects protein metabolism. Stable isotope probes will be used to establish how energy expenditures, body composition and the turnover of whole body nitrogen vary in a normal population with increasing age, particularly in regard to changes in the amount of physical activity. For example, preliminary work suggests that the protein and amino acid requirements are higher for physically active older men than the current RDA.

c. Calcium and bone density in elderly (ARS, CSRS)

Studies will be done to examine ways in which diet and nutritional status, with exercise and hormones, influence age-related loss of bone density. Increased

calcium intake will be used to determine the extent to which bone loss can be prevented. One study already planned will involve approximately 600 women subjects.

d. Requirement for vitamin D (ARS, CSRS)

Studies will be conducted on the requirement of elderly people for vitamin D and on its metabolic conversion to the active hormonal form. The capacity of human skin to produce vitamin D-3 by exposure to ultraviolet light or sunshine also will be studied. Preliminary work suggests that capacity to form vitamin D-3 in the skin decreases with age. This, together, with poorer absorption from the gut makes this an important area to study, especially in view of the increased incidence of osteoporosis in the elderly.

e. Requirement for vitamin K (ARS, CSRS)

The incidence of vitamin K deficiency is being assessed in large populations of subjects of various ages. The minimal daily requirement for vitamin K will be determined using the prevalence of abnormal human prothrombin as a sensitive indicator of subclinical vitamin K deficiency by means of a highly sensitive radioimmunoassay. The data generated will be compared with other results from a younger population. Preliminary results indicate that a significant proportion of elderly subjects had elevated levels of abnormal prothrombin, suggesting a vitamin K deficiency or a reduced ability to metabolize the vitamin. Since hardening of the arteries, bone diseases, and clotting disorders are all problems associated with vitamin K deficiency and occur in the elderly, changes in the metabolism of vitamin K with aging and how these changes affect the clinical and nutritional status of the elderly will be investigated.

f. Long-term effects of early zinc deficiency (ARS, CSRS)

Studies will be conducted to understand the effect of perinatal zinc deficiency on brain development, morphology, function and chemistry. A better understanding of trace mineral metabolism and the subsequent effects of deficient levels during rapid growth and development may suggest means of preventing some adverse effects on the brain in later life.

g. Nutrient requirements to meet physiological functions during aging (ARS, CSRS)

Throughout adult life most tissues diminish in mass, with an accompanying diminution of function. The extent to which improved nutrition can mitigate these changes is not known. Nor is it known which nutrients can modify the rate at which functions are lost. Studies will be conducted to determine the nutrient intakes that will most effectively contribute to protecting aging persons against progressive impairment of tissue-related function. With advanced age, it is desirable to identify nutritional needs for support of bodily function and general health so as to prevent chronic debility. Examples of functional systems to be studied include:

- o Protective effects of nutrients on tissues of the eye are being studied. This includes the effects of vitamin C, vitamin B-6, magnesium, and hydroxyproline on oxalate synthesis and cataract formation in aging animals.
- o Effect of nutrients on aging changes in skin-derived cells. Active projects include nutrient effects on aging and chronic sun damage (photoaging) on DNA repair, calcium effects on aging, and effects of aging and photoaging on growth stimulation by defined mitogens and by autocrine factors.
- o Other studies will determine the effect of nutrient supplementation on immune system of aged mice, with special emphasis on the role of prostaglandins and the T-cell growth factor, and interleukin 2; and the effect of changes in body composition associated with aging (increase in body fat to lean ratio) on drug disposition and clearance, and the effect of acute and chronic changes in diet on these parameters.

5. Nutrient Interactions

In any instance when the action of an individual nutrient is under examination, it is understood that its interactions with other nutrients and modifiers, including nonnutrient components of food, toxicants and other environmental modifiers is also a matter of concern. Research is needed to better understand the dietary interactions that can reduce the availability of essential nutrients for absorption and utilization, if absorbed, so that ways can be found to prevent these reactions. Of special concern are the possible adverse interactions among nutrients and between nutrients, drugs and other components of food such as fiber and associated substances (phytate, oxalate).

Studies will be conducted in the following areas of nutrient interactions:

a. Dietary fiber (ARS, CSRS)

The effects of phytic acid, oxalic acid and dietary fiber components from various food products on the bioavailability of minerals such as zinc, iron, calcium, magnesium, chromium, and copper. The level of dietary fiber is increasing in U.S. diets, but as yet no recommended or safe level has been set. Since the intake of these nutrients appears to be marginal, at least for certain population segments, a reduction in the bioavailability of these minerals could be a potential problem.

b. Mineral imbalances (ARS, CSRS)

The trend toward the increased use of mineral and vitamin supplements raises serious questions about the effect of nutrient imbalance on bioavailability, especially of minerals. For example, increased use of zinc supplements is believed to significantly reduce the bioavailability of copper, while ascorbic acid increases the availability of iron. Studies will be conducted to extend the meager information on mechanisms and consequences of nutrient-nutrient interactions, especially as related to the potential problem nutrients.

c. Major nutrient interaction (ARS, CSRS)

There is a lack of information about the effect of interactions among major nutrients (carbohydrates, proteins, and fats) and micronutrients (vitamins and minerals) on the bioavailability of micronutrients. One example which will be studied further is the unexpected finding that the simple sugar fructose, or the disaccharide sucrose (which contains fructose), renders a low copper level much more acute in animal models (rat, pig), leading to acute heart disease. In view of the low intakes of copper in comparison to that recommended by the National Academy of Sciences Food and Nutrition Board as adequate for adults, concern about the possibility of low copper intakes as a factor in coronary heart disease becomes very real, especially for those carbohydrate sensitive individuals who consume much fructose. Studies on these types of nutrient interactions will be continued vigorously.

d. Processing and preparation (ARS, CSRS)

Studies will be conducted to determine how food processing, including additives, and food preparation methods may alter nutrients and change their bioavailability.

B. Energy Regulation and Role of Nutrients in Health Promotion

The recent upsurge of interest in diet, nutrition, and health has caught the nutrition scientists and educators without complete science-based answers to many important health-related questions. Recently, epidemiologic and animal model research has suggested relationships between diet and several chronic disorders such as cardiovascular heart disease, hypertension, obesity, diabetes, kidney disease, osteoporosis, and cancer which could have vast implications for public health as well as food production and processing. Overconsumption leading to obesity, rather than frank dietary deficiencies, has become our primary problem. Obesity is a widespread health problem at every age, in both sexes, and at all income levels. It is estimated, for example, that 31% of the women and 15% of the men over 45 years of age are more than 20% above what is considered desirable weight. Obesity, defined as 20% or more above desirable weight, is either a risk factor for or is associated with a number of chronic disorders including diabetes, hypertension, coronary heart disease, complications of pregnancy, osteoarthritis, and infections. It also may be an independent risk factor for certain diseases such as cancer of the breast. USDA's goal in this area is to develop a clear understanding of the role, if any, of diet and diet components in the cause and prevention of these disorders. Emphasis will be given to studies on energy regulation and control of body weight through diet and exercise as well as on those diet components positively or negatively associated with certain of these disorders.

1. Energy Regulation and Obesity

a. Studies on energy regulation and weight control in humans (ARS, CSRS)

There is inadequate information about the factors which control voluntary food intake as related to energy balance and changes in body composition needed to understand the causes and prevention of obesity. Studies will be performed to determine the causes of differences in energy utilization among individuals who consume the same amounts of food but have quite different energy balances. The

Beltsville Human Nutrition Research Center has just completed a direct/indirect calorimeter for use with adult humans. Factors to be investigated include the effect of level of exercise on resting metabolic rate and on food consumption; the effect of body composition on energy intake and balance; and the effect of suboptimal levels of trace minerals, amino acids, or protein level on physiological appetite. The latter will be done with an appropriate animal model. Studies will be done to determine the mechanism involved in individual differences in appetite control and energy expenditure efficiency. Blocking agents will be used to determine how suboptimal nutrient levels in the brain trigger appetite. A better understanding of the effect of diet balance and exercise on control of voluntary food intake will aid greatly in achieving energy balance.

The pig will be used as an animal model to study the effect of dietary factors on physiological appetite as related to voluntary consumption of energy, changes in energy expenditure and body fat content.

b. Reassessment of energy content of foods (ARS)

There is need to measure the gross energy values of a wide range of modern foods. Present values for metabolizable energy content of foods derived by specific Atwater factors are believed to be overestimated by as much as 14% in some foods due to the less efficient lipid extraction techniques used by Atwater. The more efficient modern extraction techniques can be expected to result in more accurate heats of combustion values for foods containing high levels of structural lipids. Improved available or metabolizable energy values will be derived for such foods.

2. Role of Nutrients in Health Promotion

Recent questions have been raised about the possible relationship of diet to certain forms of cancer and diseases of the gastrointestinal tract. Diet clearly appears to influence the incidence of cardiovascular disease and diabetes. Despite this, there is little definitive information about the etiology of a number of diet-related diseases which constitute major health problems in the United States.

a. Carbohydrates and dietary fiber (ARS, CSRS)

Studies will be conducted to determine the effects of utilizable carbohydrates such as sucrose, fructose, and starch on the levels of metabolic risk factors associated with human disorders and to investigate the mechanisms for their differential effects. Also investigated will be the effects of nonutilizable carbohydrates on the metabolic processes that relate to health risk factors. Such studies will include mechanisms by which dietary carbohydrates may influence gastric emptying, digestion, absorption, secretion of gastrointestinal hormones, glucose tolerance, and tissue receptors of hormones, including insulin. These studies will involve risk factors associated with diabetes and heart disease. Information obtained will enable the establishment of adequate and safe levels of various carbohydrates, consistent with the maintenance of good health and the quality of life.

b. Dietary fibers (ARS, CSRS)

Recent studies have shown that diets high in "dietary fibers" exert desirable effects, including reduction of the clinical severity of diabetes; reduction of serum cholesterol, a risk factor for coronary heart disease; and prevention of constipation. Also, consumption of fruits and vegetables high in dietary fiber has been associated with lower levels of some types of cancer. Studies will be directed, therefore, to basic work on the mechanism of action of "food fiber," including the clinical characterization and measurement of fiber components in foods and effects of fiber/nutrient interactions; the effect of fiber on digestion and absorption; the effect of dietary fiber components from different food sources on other substances in the gut, i.e., bile acids, cholesterol, recycling minerals; the effect of food fibers on gastrointestinal tract secretions; and the effect on microflora in the intestinal tract and rate of passage. These mechanistic studies will expand the basic understanding of the processes of digestion and absorption and thus clarify the role of dietary fiber (fruits, vegetables, and cereals) in nutrition.

c. Lipids (ARS, CSRS)

Investigations will be conducted on the effect of kind and amount of dietary fat on metabolic and related physiological parameters in humans. The goal is to develop recommendations for optimal levels and types of dietary fats and their constituent fatty acids consistent with life-long maintenance of good health without adversely affecting the quality of life.

The pig is similar to humans in cardiovascular anatomy and physiology and some genetic strains of pigs are susceptible to atherosclerosis under normal husbandry conditions. The morphology and biochemistry of the atherosclerotic lesion resemble those of lesions observed in humans, and severe lesions can be induced by diet in some genetic strains more rapidly than by the usual atherogenic process in humans. The serum lipoprotein profile of the pig closely resembles that of humans and provides a useful index for comparative studies. The pig will be used as an animal model in studies on dietary cholesterol, saturated fat, polyunsaturated fat ratio, and physiological appetite as related to prevention of dietary risk factors for coronary heart disease and prevention of obesity.

Investigations will be done on the relationship between dietary essential fatty acid metabolites and prostaglandin production. What is the metabolic significance of the amounts and ratios of various fatty acids, including saturated (palmitic, stearic, butyric), monounsaturated (oleic), and polyunsaturated (linoleic, linolenic, and eicosapentanoic) as related to regulation of the synthesis of cholesterol, apolipoproteins, prostaglandins, thromboxanes, leucotrienes, etc? Can soybean oil serve as a satisfactory source of omega-3 fatty acids as compared with fish oils? Can appropriate mixtures of fats (including corn oil, soybean oil, and animal fats) provide fatty acid mixtures that will eliminate any adverse effects of saturated fats, aside from the high energy density? We need to determine how foods high in fat, but currently an important source of other nutrients in the American diet, can be modified so as to be utilized better nutritionally.

Studies will be conducted on the role of dietary lipids in the aging process, with special reference to the susceptibility to carcinogenesis. Other work will be done to determine the relationship of dietary fat and other nutrients to age-related disorders as reflected by changes in sterol and bile acid metabolism, fecal mutagenesis and elevated serum cholesterol levels. Another series of studies will be done to ascertain the effects of fatty acids and level of dietary fat on the blood clotting system and the maintenance of normal blood pressure. The overall goal is to define the dietary requirements and tolerances for dietary fatty acids and other lipids and to describe the metabolic functions of these nutrients as related to the various risk factors for chronic disorders.

d. Trace minerals (ARS, CSRS)

The effects of copper and other trace elements on cardiovascular growth, metabolism, and function will be investigated. It is hypothesized that diets in the U.S. frequently contain too little copper for optimal growth and development and physiological function of cardiovascular tissue. The effects of copper deficiency on organs that regulate cardiovascular physiology will be studied in experimental animals. Humans will be assessed for functional changes with mild deficiencies or supplementation of copper and other essential trace elements or related toxic minerals. Basic studies will be done on the metabolic mechanism by which fructose renders a copper deficiency more severe. Short-term objectives will be to define the effects of a copper inadequacy and, in turn, the requirements for copper for normal cardiovascular function.

Other trace elements to be studied are zinc, chromium, lead, and cadmium. Functional changes in humans will be assessed by heart rate and rhythm, cardiac output, exercise performance, and indices of lipid and carbohydrate metabolism. In addition, the interaction of nutrients and cardiovascular cells will be studied to learn more about the degenerative changes in the aging vascular system as related to diet.

The interrelationship between nutrition, plasma lipoproteins, and aging will be studied to determine how these can be altered by dietary change.

e. Antioxidant nutrients (ARS, CSRS)

Studies will be conducted to extend preliminary results which indicate that dietary vitamin E and/or selenium protect against spontaneous, nutrient (iron, vitamin C), and xenobiotic-induced free radical reactions in liver and brain of young rats. Differential susceptibility of brain regions was correlated with alpha-tocopherol concentrations. Prostaglandin E2 synthesis in the brain correlated with alpha-tocopherol levels and decreased with age. Dietary vitamin E and selenium were found to alter platelet aggregability through effects on platelet thromboxane A2 and aortic prostacycline. These data indicate that some brain regions have a higher dietary requirement for vitamin E than current allowances recommend. These findings will be extended to assess their relevance in humans, especially as related to the aging process.

When enough is known about the quantitative need by humans for the required nutrients and for the various sources of energy and nutrients in foods, the

facts can be mobilized to help ensure the strength and vigor needed to enjoy the things that go into making up the "quality of life." Nutritionists will be able to recognize the subtle forms of malnutrition in an apparently healthy person that may affect well-being in later years.

When data are obtained on human requirements for nutrients, nutritionists will be able to speak with a clear voice. There is adequate evidence that both the consuming public and the food technologists will respond. Food habits and eating patterns change continually. These changes, guided by the evidence of human requirements for nutrients, should lead to the disappearance of the nutrient-related health problems that continue to plague man.

C. Food Composition and Bioavailability of Nutrients

Dietary recommendations are made for many of the nutrients needed by humans. However, people do not consciously consume nutrients, but rather foods. Hence, to ensure the adequacy of any diet, it is necessary to know the nutrient composition of the various foods consumed. Indeed, it is necessary to know something about the biological availability of the nutrients in these foods and to understand the extent to which they can be digested, absorbed, and ultimately utilized by the body. Biological availability of nutrients and complementation of proteins can be enhanced by proper combinations of ordinary foods. Much needs to be learned so that guidelines concerning desirable combinations can be developed.

The USDA reference tables on nutrient composition of foods originated about 90 years ago. They are widely recognized and used throughout much of the world. These tables constitute the main source, and often the only source, of data for dietitians, nutritionists, food technologists, health professionals, or consumers to calculate nutrients in foods, food combinations, or diets.

However, certain essential nutrients are not included in the reference tables. Some foods are not included in the various reference tables, or the data have been superseded due to changes such as introduction of new cultivars or new processes. Some of the data are found to be unreliable as we improve methodology. None of the tables reflect the biologically available forms of nutrients in a food; they generally give a total value for a nutrient even though a significant fraction of that might be unavailable when eaten.

A few foods have had various nutrients added to improve their nutritional quality. This is true for many cereal products and processed fruit beverages. For most foods, however, there is little research-based information to guide the food technologist into development of nutritionally improved products. Even for such foodstuffs as wheat flour, which has been enriched with a few nutrients for more than 30 years, there is little information on the technology for supplementation with calcium, magnesium, zinc, or pyridoxine.

1. Analytical Methods (ARS)

The development of reliable, accurate, precise, cost effective, and rapid analytical techniques is the key to obtaining the needed information on the content and form of nutrients and other components of foods. Despite much

progress in this area, appropriate quantitative analytical procedures do not exist for manganese, molybdenum, cobalt, nickel, tin, and aluminum. Procedures also need to be developed for the analysis of chlorine, bromine, phosphorus and sulfur in foods. Research is needed to develop and standardize more specific rapid methods for measuring dietary fiber components and nutrients such as carotenoids, folacin, chromium, pectin, and omega-3 fatty acids. In addition, methods are needed for accurate specification of inorganic elements (form of the mineral) in foods. The form of the mineral in a food may largely determine its biological availability to humans or to animals.

Studies will be conducted to design and develop new or improved methods for the analysis of nutrients and other components in foods. Statistically reliable sampling techniques will be developed and used to ensure that the samples collected for analysis are representative of the U.S. food supply.

Where presently available nutrient composition data in foods are unreliable, suitable methodology will be developed in the following priority order:

- o First, nutrients for which a recommended dietary allowance (RDA) is established, health-related problems have been identified or suspected, and data are missing or unreliable.
- o Second, nutrients for which an RDA has not yet been established, health-related problems have been identified or suspected, and data are missing or unreliable.
- o Third, nutrients for which an RDA is established and no health-related problems have been identified, but for which data are missing or unreliable.
- o Fourth, other food constituents not now recognized as nutrients but which have suspected health implications.

Examples of research areas to receive focused attention are:

- o Studies to chemically characterize food fiber components in foods will be extended, with emphasis on chemical and physical characteristics of fibers in processed and unprocessed foods, including wheat and oat bran.
- o Studies will be initiated on appropriate techniques to separate and quantitate the several forms of folacin present in foods and important in predicting its biological activity when eaten.
- o New approaches will be made to automate the collection and handling of data on food composition. Emphasis will be given to research on the use of pattern recognition and cluster analysis to maximize the amount of meaningful data.
- o Analysis of trace elements will be improved by use of simultaneous multielement atomic absorption spectrometer.

- o Improved methods will be developed for rapid quantitation of lipids in foods, including carotenoids, and fatty acids in foods, using flow injection analyzers, chromatographic systems, and automated extraction equipment.
- o Accurate, high volume methods will be developed for carbohydrate analyses, using gas-liquid chromatographic and high-performance liquid chromatographic techniques. These will include analyses for dietary fiber components as pectins, hemicellulose, gums, etc.

2. Food Composition

USDA's Human Nutrition Information Service (HNIS) will continue to maintain the National Nutrient Data Bank (NNDB). The Agency will expand NNDB coverage of nutrients and foods as required to provide needed information on the nutrient composition of foods for use by Federal, State, and local food program administrators, researchers, health professionals, nutrition educators, the food industry, and consumers. The products of this NNDB activity are reference values for over 60 food components in thousands of foods Americans consume, presented in published and machine readable forms.

a. Available data compiled (HNIS)

Results from analyses conducted by industry, government, universities, and others will be compiled, evaluated, and entered into the NNDB.

b. Research to fill knowledge gaps (HNIS, ARS)

Research to fill knowledge gaps will be planned and sponsored. These studies fall into three general categories: (1) analyses of particular nutrients in foods known to be important sources; (2) analyses of particular foods for which data on many nutrients are lacking; and (3) analyses of new foods or new forms of foods of increasing popularity. Examples of the latter are tropical fruits and fish raised by aquaculture. Much of the research will be planned cooperatively with ARS' Nutrient Composition Laboratory at Beltsville, Maryland, and, as appropriate, in consultation with the National Institutes of Health, the Food Safety and Inspection Service, the Food and Drug Administration, the food industry, and others. Studies will utilize national sampling plans appropriate to the national distribution of food types and will employ validated analytical methods applied with proper laboratory quality control procedures. Food components believed to be important to health promotion and disease prevention receive emphasis in studies of the composition of foods. Current examples are selenium, lipids, carotenoids, tocopherols, and carbohydrate fractions, such as sugars and dietary fiber components.

c. Special studies related to the development of nutrient data (HNIS)

With understanding of the effects of handling and processing on the nutrient content of foods, nutritive values of some foods can be estimated, thereby avoiding more extensive analyses. Examples of such studies are the distribution of nutrients in solid and liquid portions of canned foods, the effects of trimming of fat from meat and poultry prior to cooking on nutrient content of

the cooked food, the absorption of cooking fat by fried foods, and the retention of nutrients after cooking and other preparation of mixed dishes.

d. Agricultural Handbook No. 8 (HNIS)

Revision of the technical reference tables on the nutrient composition of foods, "Composition of Foods...Raw, Processed, Prepared," Agricultural Handbook No. 8 (AH-8), will continue. Of the 23 sections, each showing values for a group of foods, eight sections are yet to be published. They are: finfish and shellfish products; lamb, veal, and game; baked products; sugars and sweets; grains, cereals, pastas, and snacks; fast foods; mixed dishes; and miscellaneous foods. As these are being completed, sections first published will be reviewed and updated. Computerized data sets for the new sections of AH-8 will be issued and the Nutrient Data Base for Standard Reference will be revised accordingly.

e. Special use tables and data bases (HNIS)

Food composition tables and data bases for special uses will be developed and kept up to date. For example, special tables are required by HNIS for estimating the nutrient content of U.S. food supplies each year. Also consumers and many professionals require references that are smaller and less technical than AH-8. They may show the nutritive value of only foods most commonly eaten by Americans or for only selected food components such as calories, lipids, sodium, or dietary fiber. Special data bases will allow school food service managers to assess the nutritional quality of school meals and Extension agents, other educators, and consumers to assess diets using interactive computer programs.

f. Data bases for assessing the nutrient content of diets (HNIS)

Large nutrient data bases for assessing diets reported in national food consumption surveys conducted by USDA, DHHS, and others will be developed and documented in ways that facilitate improved comparability of assessments across surveys and with past surveys. Data bases involved are Nutrient Data Base for Individual Food Intake Surveys, scheduled for revision in 1987, 1988, and 1991, and Nutrient Data Base for Household Use Surveys, scheduled for revision in 1988. These data bases must contain values for all nutrients assessed in the survey in all foods reported. Until analyses are available, best estimates will be inputted by HNIS staff. Computerized files will be developed and maintained (1) for linking the Nutrient Data Base for Standard Reference and the two survey data bases to facilitate updating through automatic calculation of values for specified recipes; (2) for converting quantities of foods as reported to weight in grams or pounds; (3) for linking food codes (and associated nutrient data) used in CSFII-85 and NFCS-87 with those used in NFCS 1977-78; and (4) for converting home-prepared and commercially-prepared food mixtures reported in surveys to their basic ingredients.

g. Data base for food industry use (HNIS, ARS, FSIS)

USDA will cooperate with the food industry, the Food and Drug Administration, and other USDA agencies in developing special data bases of the generic nutrient composition of fresh and processed foods for use in point-of-purchase labeling.

h. International data bases (HNIS, ARS)

The Department will continue to cooperate internationally in the development and exchange of food composition data and technologies. Support of INFOODS will involve a cooperative study of statistical methods for handling data, a complete merger of the USDA Nutrient Data Base for Standard Reference with the Canadian Nutrient File and other assistance in the establishment of an international network of food data systems, and the development of standard procedures for handling food composition data. The Department will continue its contact with FAO regarding the development and dissemination of data for foods eaten in developing countries.

i. Data user conferences (HNIS)

Annual Nutrient Data Bank Conferences (NDBC), will continue to provide USDA with an effective means of communicating with data users. USDA will help develop uniform and concise guidelines to help nutrient data users to obtain accurate and consistent estimates of the nutritive value of foods and diets. Also, guidelines for referencing data bases in publications will be developed, and their use promoted.

3. Bioavailability of nutrients

Reliable information is needed also on the bioavailability of nutrients in foods and food products. Such information is fundamental to every area of food production and processing research. To date very little data exists pertaining to the availability of specific nutrients for absorption and utilization as provided by food products consumed in diet mixtures. This lack of knowledge is a major obstacle in translating recommended dietary allowances for certain nutrients into adequate practical diets.

a. Methodology (ARS, CSRS)

Research will be conducted on methods for the measurement of the bioavailability of specific nutrients by humans, with emphasis on their digestion, absorption and utilization as affected by their chemical form in various foods, and factors in food mixtures that may either enhance or inhibit their availability for metabolism in the body.

The unique capabilities for use of nonradioactive stable isotopes in ARS will be exploited in studies on nutrient bioavailability in humans, including infants, young children, and pregnant women in which radioactive isotopes cannot be used. Such information will be important for developing policy recommendations about specific food items for use in government-sponsored programs.

The bioavailability of essential trace elements from foods will be determined. Plant and animal tissues used as food will be labelled with stable or radioactive isotopes both in vivo during growth or in vitro during preparation. Foods will be fed in meals in various combinations and effects of food constituents such as dietary fiber, oxalate, phytate, non-nutritive trace

elements, other micronutrients and macronutrients on bioavailability determined by measurements of utilization of tracers, chemical assay of balance and other indices of function. Methodologies will include chemical balance, mass spectrometry, gamma scintillation whole body counting, and assays of transport proteins, enzymes, metabolic products, or physiologic functions related to utilization of the elements in question.

b. Factors which influence bioavailability (ARS, CSRS, HNIS)

The effect of aging on digestion, absorption, and utilization of nutrients also will be studied. Increased attention will be given to the influence of single or multiple trace minerals and/or vitamins on the availability of other dietary components.

Interactions will be studied in experimental models and in volunteers that reveal relations between essential and toxic elements present in human diets. Bioavailability of toxic elements from foods and effects on essential nutrients will be assessed by balance studies and tissue analysis carried out under carefully controlled conditions. The balance studies in humans will be done at levels of these elements commonly found in the food supply. Functional indices will be measured.

The changes in the bioavailability of critically important nutrients which occur in processing or storage of commonly used foods or differences in new plant varieties will be studied. Such studies are needed to prevent and/or correct such alterations in the nutritive value of foods from production or processing and food handling procedures that may reduce the bioavailability of certain essential nutrients.

Available information on interactions among nutrients and the effect of such interactions on the requirements for nutrients will be reviewed. If (1) interactions can be identified and effects on requirements estimated from the literature, and (2) information on factors affecting interactions can be determined for individuals reporting in the Nationwide Food Consumption Surveys, the nutrition interaction effect on the assessment of diets of individuals will be demonstrated.

4. Production and Post Harvest Technology Effects on Nutritional Characteristics of Foods (CSRS)

Changes in lifestyles, with less physical activity, and the marked increase in number and availability of highly processed food items, including convenience foods, soft drinks, and snacks, has resulted in corresponding changes in patterns of per capita food consumption.

The selection of diets and food consumption of consumers reflect corresponding changes in their perceptions of the role of diet in health maintenance. For example, due to concern about fat intake, per capita beef consumption decreased 16% from 1976 to 1983, while per capita consumption of poultry increased 20%. Low fat milk products now make up over half of the fluid milk consumed. Also, the per capita consumption of fruits and vegetables, especially processed, has trended upward during the same period.

These and other recent changes in diet patterns have significantly affected the demand for certain food products. Continuing changes may be expected, based on findings in recent studies on human nutrition. In order to avoid excesses of some food commodities and shortages of others, better linkage between food production/processing and human nutrition objectives is needed. The long-term solution requires this, provided that the perception of the consumer is based on valid, science-based information. It becomes clear then that one way to improve the linkage between food production/processing and human nutrition is through research on better defining the dietary needs and on how to better meet them in the food supply once they are identified.

Plant and animal scientists need to have a better understanding of the nutritional needs of people, and nutritionists should become more familiar with the realities of agricultural production, food handling, and processing. Scientists and educators must help producers adjust to changing markets. Ways are needed to enlarge the understanding of the relationship between the nutritional characteristics of food products and the economic viability of the producer. If such changes are approached cautiously and objectively, research and educational efforts can be directed to develop viable solutions to the problems. With this kind of cooperation, nutritious foods can be provided to better meet the nutritional needs of consumers.

a. Improve linkage (ARS, CSRS)

Studies will be conducted to increase the linkage between the nutritional needs of consumers and the food production, processing and handling system. Examples of research approaches are listed:

- o Develop ways of minimizing losses of nutrients, especially for those which may be supplied at marginal levels in the diets of certain population subgroups.
- o Develop new foods and new food ingredients as required to meet nutritional needs.
- o Develop low-cost precooked weaning food supplements with adequate nutrient density which can be produced from indigenous materials in developing countries and distributed through commercial channels.
- o Adapt technologies for fortifying processed foods with micronutrients for use in U.S. and in developing countries.
- o Study those factors in the soil/plant production system which may significantly affect the concentration and bioavailability of mineral elements in plant foods for humans. Emphasis will be given to "problem" nutrients such as iron, calcium, magnesium, zinc, and perhaps copper.
- o Obtain additional information on the effects of naturally occurring inhibitors such as phytic acid, oxalic acid, tannins, protease inhibitors, amylase inhibitors and lectins on bioavailability of mineral nutrients to humans.

- o Control the levels of desirable components in plant products including fatty acids, carotenoids, complex carbohydrates, fibers and naturally occurring antioxidants.
- o Devise alternative ways of preserving foods with less sodium, while retaining their palatability.

b. Reduce fat levels (ARS, CSRS)

High intakes of dietary fat have been correlated with increases in incidence of certain types of cancer and coronary heart disease in animals, and epidemiological or case studies in human populations suggest similar relationships. Moreover, diets higher in fats usually are more concentrated or calorically dense in relation to volume. Accordingly, ways of reducing the fat content of high-fat foods are needed. For example, the fat content of meat can be modified through genetic and nutritional factors. Research will be continued to further explore ways to reduce the fat content of high fat foods in the U.S. food supply.

c. Calcium sources (ARS, CSRS)

The high incidence and severity of osteoporosis in elderly men as well as in postmenopausal women suggests the need for more concern about adequate calcium sources in the U.S. food supply. At present, it is extremely difficult to obtain ample calcium from usual foods unless people consume milk products. Individuals who do not consume lactose-containing foods have considerable difficulty in obtaining an adequate intake of calcium from other foods. This problem of alternative calcium-rich foods in the food supply will be investigated.

D. Food and Nutrition Monitoring Research

Effective direction of Federal programs concerned with food production and marketing, food assistance to groups at nutritional risk, nutrition education, and public health requires an understanding of the dietary and nutritional status of the U.S. population as a whole and of subgroups of the population. For this purpose, a National Nutrition Monitoring System (NNMS) defines a system of Federal surveys and other data sources.

USDA's role in the NNMS was detailed in the "Joint Implementation Plan for a Comprehensive National Nutrition Monitoring System" in 1981. A "Joint Operational Plan for the National Nutrition Monitoring System" (in review) presents NNMS as implemented with plans for activities to the mid-1990's. Although USDA participates in all of five major categories of NNMS, its role is prominent in three: food composition measurements (see section C), food supply determinants (see this section and section F) and food consumption measurements (this section).

1. U.S. Food and Nutrient Supplies

USDA estimates the supplies of food for human consumption and the nutrient contribution of these supplies each year. The historical series of such

estimates since 1909 provides trend information on food and nutrient consumption useful for agricultural and epidemiological purposes.

a. Food supply and utilization statistics (ERS)

Agricultural economists in the Economic Research Service (ERS) estimate the quantities of foods per capita that disappear into civilian food consumption each year. Estimates for about 350 basic foods at or before retail levels are based on analysis of the supply and utilization of agricultural products.

b. Nutrient content of food supplies (HNIS)

The nutrient content of per capita food supplies is determined each year using the ERS estimates, data from food consumption surveys, and food composition data from the National Nutrient Data Bank. Coverage of nutrients and other food components of importance to health will be increased as food composition data become available. In-depth analysis of trends in nutrient levels and in food sources of nutrients since 1909 will be conducted for nutrients for which there is special public health concern.

2. Food Consumption Surveys (HNIS)

a. Methodological research

- o Survey design and analysis. HNIS will increase efforts to identify hypotheses and plan analysis of data to meet its many and diversified uses before surveys are designed, thereby improving the likelihood that the survey will meet priority data needs. Information to be obtained in NFCS 87, especially from new lines of inquiry, will be examined and appropriate statistical techniques will be delineated.
- o Needs assessment. Needs for methodology studies will be identified and studies conducted. This program will draw upon experience gained in survey efforts and feedback from data users. Examples of studies to be undertaken are linkages between the household data (food as it enters the kitchen) and individual data (food as eaten); the feasibility of integrating food frequency measures developed in earlier research into NFCS and CSFII, especially for linkage with NHANES; methods for more precise measures of food portions by children and the elderly; and further validation of CSFII data. A comprehensive and sequential plan will be developed to study procedures and questions and their effect on the reliability and validity of data as well as the time and cost of data collection.
- o Longitudinal survey analysis. Continuing surveys conducted in 1985 and 1986 were designed to collect six individual days' data spread over the year from each respondent. Results from this methodology and other suitable data sets will be used for in-depth analysis of effects of methods used in food consumption surveys on survey results. Some topics for study are intra- and inter-individual variation in intakes from consecutive and nonconsecutive days, drop off in data reporting in later days of the survey, and alternative methods for imputing missing data.

- o Application of standards. The recommendations of authoritative groups, such as the National Academy of Sciences, are used as standards for assessing diet quality. The Recommended Dietary Allowances (RDA), are used as standards for assuring that diets will meet the nutritional needs of nearly all healthy people. Diets that do not meet the RDA are not necessarily inadequate because the RDA include a margin of safety above average nutrient requirements and because individuals vary in their nutrient needs. An HNIS-sponsored study by the Food and Nutrition Board (Nutrient Adequacy: Assessment Using Food Consumption Surveys, 1986) suggests a method for determining the proportion of the population at risk of developing nutritional deficiencies based on knowledge of the distribution of nutrient requirements in various sex/age groups and data on "usual" nutrient intakes by individuals in these groups. As noted in the report, application of the method is not possible because of the lack of information on the distribution of nutrient requirements. HNIS is studying various ways of improving estimates of "usual" intake.
- o Technical survey support systems. The provision and update of technical support systems for the household and individual components of NFCS and CSFII is a major continuing effort in HNIS. These documented systems are essential to the conduct of HNIS surveys and are a primary resource for others who conduct surveys. Included are systems of food identification codes; volume/weight tables for converting quantities of foods in units as reported to pounds or grams (units in which quantities are aggregated and for which nutrient data are available); factors for converting quantities of some foods to more meaningful equivalents for aggregation (i.e., dairy products to their milk equivalent in terms of calcium content); and nutrient composition of a pound or 100 grams of each food reported.

b. Collection and reporting of survey data (HNIS)

- o Large decennial surveys. Nationwide Food Consumption Surveys will continue to be conducted at ten-year intervals to monitor the dietary status of the nation in terms of food and nutrient consumption by households and by individual household members. The last such survey was conducted in 1977-78; the next will begin in spring 1987 and continue through winter 1988. The 1987 survey, like the previous ones, will collect information by interview on quantities of foods used and the money value of food used by households during the 7-day period prior to the interview; on quantity of foods, and time and place they were eaten by each household member for three days (a recall of one day's food and a record of two more days); and on sociodemographic characteristics such as income, education, and participation in food assistance programs. In the 1987 survey, certain definitions and procedures will be modified to provide greater comparability with National Health and Nutrition Examination Survey (NHANES). Changes will also take into account methodological improvements indicated by studies since NFCS 1977-78 and priority needs for new data as identified by USDA agencies, data user conferences, and other means. The 1987-88 survey is designed to be a stratified area probability sample of households in the 48 conterminous States. A special sample of low-income households also will be surveyed.

- o Continuing Surveys. Continuing Surveys of Food Intakes by Individuals (CSFII) will measure dietary change between the ten-year surveys. These relatively small surveys conducted each year will provide two-year moving averages of food and nutrient intakes for three consecutive days by men and women 19 to 50 years of age and five-year moving averages for three consecutive days by other sex-age groups.
- o Reporting survey data. Basic data from the surveys will be made available through a System of Dietary Data Bases (SDDDB) out of the National Technical Information Service. Tabular analysis of NFCS-87 and Continuing Surveys will be reported in USDA reports. Indepth analysis of data to address issues of special interest to HNIS and USDA will be conducted.

A Calendar of Major USDA Food Consumption Survey Events 1986-1992 follows:

1986

- o Nutrient Data Base for Individual Food Intake Surveys, Release No. 2, issued. This data base, with twice the number of food components of Release No. 1 (1978), is being used to calculate the nutrient content of diets from Hispanic HANES as well as HNIS surveys.
- o Food and Nutrition Board study on standards for use in evaluation of nutrient intakes from dietary surveys completed. Report published: "Nutrient Adequacy: Assessment Using Food Consumption Surveys."
- o First Joint Nutrition Monitoring Evaluation Committee report sent to Congress: "Nutrition Monitoring in the United States."
- o Two regional conferences on national nutrition surveys and State data needs conducted by HNIS and NCHS for State health and nutrition program leaders.
- o Continuing Survey of Food Intakes by Individuals (CSFII) collected data on national samples of women 19-50 years and children 1-5 years in the general population and in the low-income population.
- o System of Dietary Data Bases (SDDDB) with documentation, initiated with data from CSFII-85 through National Technical Information Service.
- o SFII-85 tabular results reported. Extramural cooperative agreements for indepth analysis of CSFII-85 data awarded and a workshop for investigators conducted.
- o Tests of statistical approaches to use of standards for assessment of diets for risk of nutrient inadequacy initiated.
- o Contract for data collection of Nationwide Food Consumption Survey 1987 (NFCS-87) awarded. Questionnaire and procedures in NFCS-87 reflect cooperative review by HNIS and NCHS staffs and revision for comparability with NHANES III, as planned for 1988-1994.

1987

- o Joint Operational Plan for the National Nutrition Monitoring System 1986-1996. This extends the Joint Implementation Plan, 1981-1987.
- o NFCS-87 initiated.
- o Nutrient Data Bases for Individual Food Intake Surveys, Release No. 3 issued.
- o Comprehensive review and interpretation of research on methodologies for collecting dietary data completed and published.
- o Methodology research reviewed at conference for State health and nutrition program leaders.

- o CSFII-86 data entered into SDDB.
- o CSFII-86 tabular results reported. Extramural cooperative agreements for analysis of CSFII-86 data awarded.

1988

- o Nutrient Data Base for Individual Food Intake Surveys, Release No. 4, issued.
- o Nutrient Data Base for Household Food Use, Release No. 2, issued.
- o NFCS-87 completed. Extramural cooperative agreements for analysis awarded.
- o Workshop for users of NFCS data conducted.
- o Annual surveys to support reports of moving averages of food and nutrient intakes--general population and low-income--planned and initiated.
- o Tests of statistical approaches to use of standards for assessment of diets completed. Future research on standards determined.

1989

- o NFCS 1987-88 data entered into SDDB.
- o NFCS 1987-88 tabular results reported.
- o Second report on NNMS completed and sent to Congress.
- o Annual survey of food intakes conducted (CSFII-89).

1990

- o Additional NFCS 1987-88 tabular results reported.
- o Annual survey of food intakes conducted (CSFII-90).
- o Workshop for users of annual survey data conducted.
- o CSFII-89 entered into SDDB.

1991-1992

- o Annual surveys of food intakes conducted (CSFII-1991-92)
- o CSFII-90 and -91 entered into SDDB.
- o Nutrient Data Base for Individual Intake Surveys, Release No. 5, issued.
- o Third Report of NNMS completed and sent to Congress.

3. Dietary Assessment (HNIS)

a. Assessments at three levels of consumption

The food and nutrient content of U.S. food supplies (annually), of food used by U.S. households (after NFCS 1987-88), and of food eaten by individuals (annually), will be described and assessed.

b. Comparative assessments

Food and nutrient consumption at all three levels will be assessed relative to levels for earlier periods. Comparisons will be made among subsets of the population (by income, size, and location and program participation status of household and by sex, age, and race of individuals, for example.) Levels of nutrients in household and individual diets will be assessed relative to standards (Recommended Dietary Allowances (RDA), Dietary Guidelines for Americans).

c. Studies of food consumption patterns (ERS)

ERS develops estimates of annual per capita food consumption and analyzes annual changes and trends. This information is developed through analyses of the supply and utilization of agricultural commodities. ERS prepares an annual statistical bulletin containing current and historical data on food consumption, prices, and consumer expenditures. ERS estimates are used by nutritionists in USDA's Human Nutrition Information Service to estimate per capita nutrient availability. ERS will continue these research efforts and develop improved methods for analyzing the use of certain commodities in manufactured food products and new wholesale to retail conversion factors for foods.

4. Determinants of Dietary Status (HNIS)

Research will be conducted to increase understanding of the factors that influence dietary status. These studies have special implications for programs relating to food production and marketing, to food assistance, and food and nutrition education. For example, results will be used by HNIS and others in the public and private sectors to target food and nutrition programs and to develop appropriate dietary guidance.

Six general categories of research interest have been identified for study using CSFII-85 and -86 and NFCS-87 results:

- o Personal, demographic and household factors affecting dietary status measured in terms of intake of nutrients and other food components.
- o Personal, demographic and household factors affecting dietary status as measured in terms of intake of foods and food groups.
- o Intake of foods and food groups as a factor affecting dietary status measured in terms of intake of nutrients and other food components. Intake of fat will be an important research focus.
- o Eating patterns as factors affecting dietary status measured in terms of intake of nutrients and other food components and/or intake of foods and food groups.
- o Health-related factors affecting dietary status measured in terms of intake of nutrients and other food components and/or intake of foods and food groups. The association between body weight and diet is an important research area.
- o Methodological factors affecting the measurement of dietary status in terms of intake of nutrients and other food components and/or intake of foods and groups of foods.

5. Nutritional Status

Research will be done to improve nutritional assessment and to evaluate the pathogenesis of malnutrition. Reliable knowledge of the nutritional health of the populace and causes of malnutrition are essential for evaluating government action programs and for formulating government policies. Many of the present methods lack sensitivity and specificity and their relationship to functional

indices is poorly defined. Better methods are needed for the assessment of nutritional status for several nutrients including calcium, magnesium, vitamin B-6, folacin, vitamin D, vitamin K, biotin, pantothenic acid, manganese, copper, selenium, molybdenum and chromium. New technological advances have provided new opportunities for assessment of body composition, energy, expenditure, and measurement of related metabolites. Examples of research which will be conducted to develop reliable, inexpensive, improved methods for assessing nutritional status include:

a. Body composition methodology (ARS, CSRS)

Comparisons will be made of several methods used for measuring body fat, protein and water content across ages, gender, body builds, races, and different levels of activity. The methods will include measurement of potassium 40, total body water, total body electrical conductivity or impedance, near-infrared interactance, and anthropometry. A method will be developed for determining total body water using deuterium or oxygen 18. The use of ultrasound also will be assessed for measuring body fat content in young infants.

b. Nutritional epidemiology and nutritional status surveys of elderly (ARS)

The Human Nutrition Research Center on Aging is conducting a comprehensive nutritional status survey in special elderly populations in the Boston area. Special attention is being given to describing the distribution of nutrient intake and blood levels in selected free-living and institutionalized populations of men and women over 60. Analysis of demographic, social and medical history information will be used to compare the data from this survey with previous health surveys. Attention will be given to drug-nutrient interactions. Body composition of elderly subjects also will be measured by proton activation analysis and whole body counting to detect changes in body composition, as related to alterations in nutritional status. The aim is to develop a method to measure the total quantities of the major body components.

c. Nutrient intake and performance methodology development (ARS, CSRS)

Behavioral and physiological methods for assessing nutritional status will be developed and validated. Examples of types of methods are neuromotor, sensorimotor, cognitive, physical activity, EEG, EKG and NMR. Personal computers will be adapted for the collection of food intakes and processing of nutrient intakes of individuals in nutritional status studies.

d. Improve trace mineral assays (ARS)

Methods that will receive attention include reliable ones for measuring trace metal levels in blood cellular components and the use of platelet aggregation as a clinical tool for determining zinc nutriture. Catecholamine metabolism in humans will be assessed. Levels in blood and urine will be measured and related to zinc, copper, and iron nutriture and neuropsychological function of human volunteers.

e. Evaluate nutrition action programs (ARS)

Anthropometric and biochemical measures of nutritional status will be validated and field tested for use in FNS program needs assessment, certification and evaluation. These methods will be designed for use in specific FNS programs and identified settings.

f. Assessment of nutritional status in dietary requirement studies (ARS)

The effect of varying nutrient intake patterns (low, marginal, and excess nutrients) on nutritional status and performance in both sexes and over a range of physical activity levels will be measured.

In these studies, efforts will be made to identify the most sensitive physiological and behavioral endpoints for assessing the metabolic and functional requirements for essential dietary nutrients. This will include the role of nutrients in the immune response.

E. Food and Nutrition Information and Education Research

Nutritional education serves as the vital link between nutrition science and the consumer's ability to make appropriate dietary decisions. Nutrition education research includes (1) studies of dietary practices, food consumption patterns and their determinants (socioeconomic, attitudinal, and other) and (2) studies of methods and strategies for informing and educating the public and professionals about nutrition, health, and dietary practices. Several USDA agencies develop knowledge through research that is basic to nutrition information and education programs, such as human nutrition requirements; nutrient composition of foods; the food and nutrient content of diets of the population and its subgroups; the personal, socioeconomic, demographic, health-related, and other factors that may influence the dietary status of the U.S. population; food marketing and labeling regulations; and suitable and safe food preparation and management procedures. National surveys that measure change in attitudes and knowledge about food, nutrition, and health are conducted by the Food and Drug Administration and by the private sector. Further research is needed to provide answers to questions such as what are appropriate nutritional objectives or dietary guidelines for the public, what information or messages are needed to help meet the objectives or guidelines, to whom should these messages be directed, and what materials and techniques are effective in communicating the messages? Priority research will be identified and conducted, primarily by HNIS, ES, and FNS.

1. Establishing Dietary Guidance Policy

Current Federal policy for dietary guidance for the general public is given in "Nutrition and Your Health: Dietary Guidelines for Americans," second edition, published jointly by USDA and DHHS in 1985. The second edition reflects recommendations of a nine-member Dietary Guidelines Advisory Committee. HNIS provided staff and financial support for the Committee and coordinated the publication.

a. Policy-setting procedures

- o Future guidelines. A new Dietary Guidelines Advisory Committee will be appointed jointly by USDA and DHHS in 1988 to review the existing guidelines relative to new knowledge and to comments by the public. If the Committee so recommends, a third edition of the guidelines will be published jointly in 1990. Otherwise, the second edition will remain the central Federal policy statement on dietary guidance for the general public.
- o Responsible agency. USDA's HNIS has been directed by the House Appropriations Committee "to provide the policy basis for issuing Federal nutrition guidance to the public" and "to ensure that the Federal government speaks with one voice in issuing the most accurate available nutrition information." HNIS, therefore, will coordinate subsequent reviews and revisions of the Dietary Guidelines and will chair the Dietary Guidance Working Group, established under USDA's Subcommittee for Human Nutrition to assist in seeing that guidance materials conform to the Dietary Guidelines (See VI A).

b. Technical support (HNIS)

- o Norms and baseline data. Dietary information from national surveys will be used as population norms, for the establishment of realistic goals for dietary improvement, and as baseline data for measurement of such improvement.
- o Dietary change to meet guidelines. Research to determine the change in food consumption behavior required to achieve alternate guidelines will help demonstrate the relative practicality of such guidelines. Food consumption behavior will be defined from NFCS and guidelines will be based on the RDA and other levels of food components for health promotion and disease prevention suggested by authoritative groups. Mathematical models will be used to cause changes in food consumption to be minimized while achieving the specified guidelines. Such studies help identify dietary changes appropriate for emphasis in guidance materials as well as demonstrate the practicality of the guidelines.
- o Consumer reaction to Dietary Guidelines. Uses of and reactions to the Dietary Guidelines by professionals and consumers will be studied. The Consumer Information Center, the primary distributor of free copies of the Dietary Guidelines bulletin, will cooperate with HNIS in an evaluation of the bulletin by persons ordering the bulletin. Socioeconomic data on these persons will be obtained also. This information will be used in preparing for future revisions of the Dietary Guidelines, and for designing supplementary guidance materials.

2. Food and Nutrition Materials

USDA will develop some basic dietary guidance materials for use by professionals and the general public. Prospectuses for and drafts of all such materials will be reviewed by the Dietary Guidance Working Group. Most materials will feature concepts in the Dietary Guidelines and results from USDA research on human nutrition requirements, food composition, food consumption behavior, food

selection, food money management, and food handling and storage. Materials will be designed to communicate messages effectively to promote desired changes in knowledge, behavior, and attitude.

a. Targeting of guidance (HNIS)

Studies of dietary status and their determinants (See Section D4) and related research will be interpreted for their implications for targeting nutrition education efforts. Audiences and appropriate messages for dietary improvement will be identified. Interpretations will be presented to nutrition educators and health professionals who conduct community programs through articles in professional journals and by electronic means.

b. Tools and techniques for communication (HNIS)

Research will be continued to determine effective ways to communicate with the general public and with target audiences with special needs, such as the elderly and low-income populations. The effectiveness of materials will be measured through formative and summative evaluation relative to changes in knowledge, behavior, and attitude. Cognitive response to use of materials will be measured from message exposure to behavior modification to improve understanding of the causal processes that underlie the effectiveness of communication. Educational approaches such as computerized dietary analysis feedback and self-assessment tools will be evaluated.

c. Development of message content (HNIS)

- o Materials to supplement the Dietary Guidelines. These materials, developed with advice from the Extension Service, will provide information to help consumers apply the guidelines in making decisions about food selection and preparation. They will reflect HNIS research in food composition, food consumption behavior, food preparation procedures and communication theory. Seven such bulletins, published in 1986, "Dietary Guidelines and Your Diet" will be evaluated.
- o Food selection guides. Updated and/or new food selection guides and guidance systems are needed by consumers and nutrition educators. Food selection options, as well as dietary goals and standards, are more complex than when earlier guides, such as the four food groups, were prepared. New guides and systems will be developed and promoted on sound nutrition principles, will be practical as indicated by relationships of food guides to food consumption behavior from national surveys, and will be understood and useful by the target audience as evidenced by formative and summative evaluations.
- o Food preparation, handling and storage research. Studies to determine proper procedures for preparing, handling and storing foods are conducted considering dietary guideline concepts, nutritional value, cost, acceptability, safety, ease of preparation, and foods newly available on the market. Procedures, including recipes, will be used for illustrating Dietary Guidelines and food money management principles in material developed for use by nutrition educators and the public.

- o Nutritive value of foods. Information on the nutritional qualities of foods is important in making food choices. Materials will be developed for users differing in their interest in and ability to use technical and detailed information. As examples, "good" food sources of nutrients will be identified, sample recipes and procedures for preparing the foods will be given; the nutritive value of foods in usual-size portions that might be substituted in meals will be compared, and nutritive values will be expressed graphically and as percentages of the U.S. Recommended Dietary Allowances.
- o Food money management research and guidance. This research and guidance is designed to help families maximize nutrition and satisfaction while eating within their food budgets. Materials take into account research on food consumption and money management practices by households as understood from national surveys; on research on new options to food shoppers, such as new convenience foods, food sold in bulk, in-store salad bars, and fast foods; and on changes in food consumption and practices shown through mathematical modeling to improve nutrition while controlling cost.
- o Revision of USDA family food plans. The USDA family food plans at different cost levels used as national standards for food use and food costs by families differing in composition and economic level will be revised. The revision will use information on food consumption and food prices from NFCS 1987 and the most recent nutritional standards available (RDA, Dietary Guidelines). It will incorporate improvements in the food plan development model identified since the last revision in 1983. In the model, food consumption patterns from surveys are changed only as necessary to ensure that food plans meet specifications for nutrient content, cost, and practicality.
- o Cost of food estimated monthly. Monthly statements on the costs of foods in the different food plans will be prepared and released. Statements will allow families of different compositions to determine costs appropriate to their situation. Estimates of the Thrifty Food Plan will be made for the 48 States, Alaska and Hawaii, specifically for use by USDA in determining benefits in the Food Stamp Program. This food plan is the legislated standard for food stamp benefits.
- o Sample meal plans for the thrifty food plan. Special materials will be developed to show how low-income families can follow the newly revised Thrifty Food Plan. Communication techniques will be used that have been shown through research to be most acceptable to and effective with low-income populations. These materials will contain sample menus, food lists, and recipes, as well as tips on improving food shopping skills. Recipes will be tested in USDA laboratories and the materials will be evaluated by low-income families.
- o Computerized diet analysis. Many nutrition educators, especially in the Extension Service, have used computerized diet analysis as a successful nutrition education technique. However, the different software and data bases used cause systems to vary in ease of operation and in accuracy of analysis. To improve the quality and comparability of these programs, HNIS, with Extension Service staff, will develop and pilot-test a microcomputer program and necessary data bases. The program and data, updated regularly, will be available through the National Technical Information Service.

F. Research on Government Policies and Socioeconomic Factors

1. Government Policies (ERS)

An ongoing research activity for ERS is analysis of the effects of Government policies, especially food policies, on both producers and consumers. This research provides insight as to the effects of existing and alternative food and agricultural policies on food consumption, dietary levels, and the nutritional status of target populations.

The most visible Government food policies are the food assistance programs. Recent research by ERS economists has focused on the effects of existing programs on food consumption, nutrient levels, and perceived hunger of participants. Another ERS study looked at whether commodity donation programs displace commercial sales. Researchers found that some sales of American cheese and margarine were displaced by donations through the Temporary Emergency Food Assistance Program. Future studies will expand this research and analyze the impacts of alternative assistance programs and policies on food consumption and nutritional status of low-income households and other subpopulations served by the programs. To provide insight into the geographic equity of food stamp benefits, ERS is conducting research on cost variations of the Thrifty Food Plan associated with kinds and locations of supermarkets.

Another set of Government policies that affect food consumption are policies regulating the safety and quality of the food supply. Previously, ERS has estimated the public health protection benefits of selected Federal meat inspection practices; examined the costs to industry (from farm to restaurant) of foodborne diseases; and projected the potential benefits and costs of irradiating meat and poultry to kill or inactivate human pathogens. Estimates of public health benefits can be used to assign priority areas for food safety research and regulatory efforts.

ERS' current focus is an overview project on the extent of foodborne pathogens and their likely economic costs. Next, control options will be investigated for the most costly pathogens at the farm, processing, and retailing levels. Benefits and cost will be estimated for the various control options.

Many foods are subject to grades and quality standards which were established many years ago. While originally designed to assure consumers of accurate information as a basis for making purchase decisions, food processing and marketing methods have changed over the years. This raises the question of whether existing grades and standards are still appropriate and whether they foster or retard marketing efficiency. ERS has initiated research into documenting existing food standards and evaluating their impacts on market efficiency.

2. Socioeconomic Factors (ERS)

ERS conducts research on factors that influence consumer demand for major food products and individual food items. Socioeconomic factors that are analyzed

include regional population shifts, increasing life expectancy, rising incomes, declining birth rates, and health and nutrition concerns. This information is useful for projecting demand for food as demographic characteristics of the population change.

A recent ERS publication, U.S. Demand for Food: Household Expenditures, Demographics and Projections, used the 1980-81 BLS Consumer Expenditure Survey to analyze the effects of region of household residence, race, age, and season of the year on per person expenditures for foods and beverages. Similarly, consumers' responses to changes in prices and incomes, as delineated in U.S. Demand for Food: A Complete System of Price and Income Effects, have even greater economic significance, especially in the short run, in determining diet and consumption patterns. Moreover, these responses have important longer run implications for resource allocation and the mix of foods produced and/or available for domestic consumption.

Because of the important influence of food prices on consumption patterns, ERS has examined the extent food prices differ between U.S. cities and between firms within cities. Findings indicate that there is more variation in food prices among firms within a city than there is among regions of the United States. This has implications for the way food stamps and WIC benefits are issued.

Health and nutrition concerns are also important determinants of food consumption and dietary practices. ERS has examined the link between health and nutrition concerns and food choices and how the food industry has reacted.

Future ERS studies of food demand will include the role and effect of advertising and promotion on food demand; the frequency of purchase of selected foods and changing patterns of household food expenditures; and improved methods for measuring price and income response and forecasting food prices and per capita food consumption.

IV. USDA FOOD AND NUTRITION INFORMATION AND EDUCATION PROGRAM (FY 1987-92)

Nutrition education is an essential element of a national policy leading to improved health and quality of life. Congress has assigned USDA leadership in the formulation of nutrition education policy and the establishment of a national nutrition education program (Section I. E.).

A. Current Program Parameters

The food and nutrition information and education activities in the Department are largely the responsibility of eight or more separate agencies who report to several Assistant Secretaries (Section II. B.). Each agency determines the kind of information needed for its purpose and the manner in which it will be presented, with coordination with other agencies and limited guidance from the Office of the Secretary. However, the ultimate goal of the programs of the agencies is the same--to help individuals to improve their nutritional health and well-being through informed food choices.

USDA agencies and their primary food and nutrition information and education responsibilities are listed below:

- o The Extension Service (ES) operates Food and Nutrition Education Programs in partnership with the Cooperative Extension System to disseminate knowledge and applied research directly to the general public. ES also operates the Expanded Food and Nutrition Education Program (EFNEP), a mandated program for low income families and youth.
- o The Human Nutrition Information Service (HNIS) coordinates Federal dietary guidance policy, develops research-based dietary guidance materials for the general public, and reports results from its research in food composition, food consumption, and nutrition education to professionals;
- o The National Agricultural Library (NAL), through its Food and Nutrition Information Center (FNIC), collects and disseminates information on a wide range of nutrition topics and accumulates and loans nutrition education materials to educators;
- o The Agricultural Research Service (ARS) and the Cooperative State Research Service (CSRS) report results from their programs of food and nutrition research usually to professional audiences;
- o The Food Safety and Inspection Service (FSIS) is responsible for the safety, wholesomeness and accurate labeling of meat and poultry products and for informing the public on safe handling of these foods;
- o The Agricultural Marketing Service (AMS) is responsible for the grading of foods and for the accuracy of promotional materials of some commodity groups;

- o The Food and Nutrition Service (FNS) supports the nutrition education components of food assistance programs they administer--Child Nutrition, WIC, Food Stamp; and
- o Office of Governmental and Public Affairs (OGPA) provides review and coordination of all food and nutrition information disseminated by USDA.

The collective information and education activities of these agencies form USDA's Food and Nutrition Information and Education Program. Through agency education materials and activities, established food and nutrition knowledge is restated and knowledge from new research is introduced. However, as the agency listing indicates, programs differ in several respects, such as message content and audience, the phase of the education process involved, the organizational levels at which the program is conducted, and whether its objective is informational or educational.

Message content and audience. The general content of the nutrition messages and the audiences targeted may differ depending on the agency's mission. Much of USDA's information and education program is directed to the general public. In addition, some groups are targeted for special emphasis. For example, the WIC program for which nutrition education is a legislatively mandated component serves women, infants, and children at nutritional risk; the Nutrition Education and Training Program (NET) offers grants to state education agencies to provide training opportunities for both teachers and school food service workers, as well as nutrition education for students; the Food Stamp Program has some information activities to help food stamp recipients improve their food shopping and money management skills; and the Expanded Food and Nutrition Education Program (EFNEP) teaches nutrition and helps low-income homemakers to manage their food resources wisely.

Phase of education process. Agency programs may differ in the phases of the education process involved. For example, some agencies conduct research that contributes to the message content, assesses food consumption practices, and/or identifies effective communication procedures; some coordinate the planning and development of education programs; and some implement and evaluate programs. HNIS is heavily involved in assisting food consumption practices and dietary status, in identifying effective communication methods, and in developing messages. The Cooperative Extension system, in conjunction with researchers in land-grant universities and educators throughout the country, is involved in several or all of these phases.

Organization level. Information and education programs of some agencies are conducted entirely at the Federal level. Other programs within the general purview of USDA are planned and implemented by regional, State or local staffs. For example, within the Cooperative Extension Service, State specialists in food and human nutrition located in land-grant universities and local Extension agents in 3,150 counties throughout the U.S. plan and deliver nutrition programs, based on clientele needs and interests. Also, WIC programs

are managed by local health or other agency staff selected by State departments who have received USDA grants. The same is true for recipients of NET funds. In other programs such as Child Nutrition and Food Stamp programs, the education effort is cooperative, with Federal offices providing some leader training, guidelines, and/or materials, and State and local agencies implementing education activities.

Information or education. USDA Programs can also be characterized on the basis of their objectives. Informational programs have as their major objectives producing "nutritionally literate" consumers. In such programs it is assumed that consumers can use the research-based information on food and nutrition USDA provides in published and other forms to make food choices consonant with good health and well-being. Educational programs, in contrast, aim to produce consumers whose attitudes and food consumption behavior are consonant with good health and well-being. Examples are EFNEP, ES Food and Nutrition Programs, and WIC. Such programs have the potential to affect consumer demand for a wide variety of food products in the marketplace as well as the health and well-being of participants.

B. Future Programs

The plan for the USDA Food and Nutrition and Education Program for the next 5 years described here focuses primarily on improved coordination of activities of USDA agencies at the Federal level. USDA's Subcommittee for Human Nutrition (SHN) of the Committee on Research and Education (Section VI. B.) will serve as the overall coordinator among interested agencies in the implementation of such efforts. Primary goals are improvement in message uniformity, links between research and education, message delivery, and evaluation of nutrition information and education programs. Selected activities are discussed separately by goal below.

1. Carry out USDA's responsibility to assure that the Federal government "speaks with one voice" when issuing dietary guidance.

Language from the House of Representatives Committee on Appropriations report on the 1986 Agriculture, Rural Development and Related Agencies Appropriation Bill indicated that the Federal Government "speaks with one voice" when issuing dietary guidance information to the public (Section I.E.). USDA's Human Nutrition Information Service is charged, by this legislative language, with responsibility for providing the policy basis for issuing Federal nutritional guidance to the public and for coordinating with others to ensure that messages from the Federal Government are indeed uniform. This concern about conflicting messages also has been targeted by the USDA's Human Nutrition Board of Scientific Counselors (Section VI. C.).

When the term "speaking with one voice" is used, the emphasis is on the message of dietary guidance. With respect to message, former Secretary Block specified the "Dietary Guidelines for Americans," issued in its second edition in 1985, jointly by USDA and DHHS, as the basis for nutrition education activities and efforts within the Department. To accomplish this, USDA intends to keep the Guidelines current, to promote the bulletin featuring the Guidelines, to develop

supplemental information to help people know how to follow the Guidelines, and to work within USDA and with outside groups to gain acceptance and use of the Guidelines as the primary dietary guidance message.

Keeping Guidelines current. These Guidelines will be revised as necessary to reflect the new knowledge from research on human nutrition requirements and the relationship of diet and the risk of chronic diseases. Within the next five years the two Departments will call together an advisory committee of nutrition authorities to review related research and comments from professional groups and others and recommend what, if any, changes are appropriate.

Promotion of Guidelines. The Department has promoted the Guidelines through a free distribution of almost 1 1/2 million copies of the 24-page bulletin that presents the guidelines and many camera-ready copies of the bulletin for reproduction by others. The guidelines have been featured through professional meetings, journalist conferences, television and radio interviews, press mailings to over 2,000 periodicals, contacts with the food industry and others, and educational classes for the public in every state.

Supplemental information. Materials directed to several audiences are devoted to helping put the Dietary Guidelines into practice. For example, HNIS has published seven "minibulletins" directed to household food managers that provide additional information on the seven Dietary Guidelines and will publish seven more to show how to use the Guidelines together in various food-related activities. These publications are used by ES in their Food and Nutrition Programs at the county level. Also FNS is revising its School Lunch Recipe File to incorporate Guideline concepts and will develop training materials for school food service personnel to assist in their uses.

Uniformity within USDA. To achieve uniformity of messages from USDA, an interagency group, chaired by HNIS, has been formed to coordinate dietary guidance information efforts. This Dietary Guidance Working Group functions under the Subcommittee for Human Nutrition (see Section VI. B.). The group also has a representative from DHHS. It will review prospectuses and final drafts of all dietary guidance materials issued by the Department.

Attention will be directed toward communicating with USDA staff at regional, State, and local levels to assure that these communicators have a full understanding of the Dietary Guidelines to be utilized in issuing dietary guidance at the State and local levels. Also, additional information and materials needed by field staff and cooperatives will be developed where efficient, to help meet new needs identified through Federal, regional, and/or State activities.

Uniformity among Departments. The Department will continue to work with Federal agencies outside of USDA and the Interagency Committee on Human Nutrition Research (ICHNR) in nutrition education programs. Cooperation will help ensure

that all Departments will use the Dietary Guidelines for Americans when giving dietary guidance to the public. Efforts are underway to have USDA representatives on dietary guidance review groups within DHHS.

Coordination with private sector. Professional organizations such as the American Dietetic Association, the American Public Health Association, the American Heart Association, and some State public health organizations make dietary recommendations for the public and set dietary goals and guidelines that differ in some respects from the Dietary Guidelines. USDA, with the ICHNR, will work with these groups in an attempt to minimize the diversity of guidance about diet being disseminated to the public. USDA will also work with commodity and trade associations to incorporate the relevant Dietary Guidelines in their educational materials prepared for distribution to the general public.

2. Improved linkages between research and information and education activities.

The Interagency Committee on Human Nutrition Research (ICHNR) (Section VI. B.) defined human nutrition research as "the pursuit of new knowledge to improve the understanding of nutrition as it relates to human health and disease" and described five major areas encompassed by such a definition, including nutrition education. Nutrition education research, as defined by that Committee has as its intent "to determine the most effective means of conveying information about the health impact of various dietary practices and advances in human nutrition science to the general public and to health professionals."

Therefore, all types of human nutrition research are integral to nutrition education research as a basis for establishing the specific content of educational messages, and for understanding the nature of the food supply, the food consumption practices of the population, and the underlying factors that influence food consumption behavior. To provide current, reliable nutrition information to food consumers, scientific findings on the following topics are essential--human nutrition requirements, bioavailability of nutrients from food and nonfood sources, the nature of the food supply, food consumption trends, factors affecting food consumption behavior, needs and wants of target audiences for specific nutrition information and preferred information delivery techniques, and means by which nutrition information is communicated to various audiences and used by individuals in making food consumption decisions. Various USDA agencies are involved in the conduct of such research, and stronger research/education linkages are desirable.

Objectives of improved research and education linkages include better, more timely access by educators to current research results and authoritative sources of information on food, nutrition, health issues, and initiation of mechanisms for educators to help identify research needs. The term "research" as used here includes studies to determine the basis for establishing the content of information messages, studies to identify groups needing information, and studies to identify effective techniques for message delivery. Several initiatives are underway or planned:

The recently developed Human Nutrition Research Information Management System (HNRIMS) contains information on a broad base of Federally funded research projects underway, including those entered into the Current Research Information System (CRIS). It provides information on current human nutrition research useful to nutrition educators and program planners at Federal, State, and local levels and others who seek such information.

Researchers from the Human Nutrition Research Centers in ARS and the Human Nutrition Information Service participate in issue-oriented exchanges and projects with Federal and State Cooperative Extension staffs. One example is an extension and research forum held recently at the Baylor Child Nutrition Center with ARS scientists and Extension food and nutrition specialists participating. Another example is an ES/HNIS project underway to develop and test in local ES programs a computerized diet assessment system.

Cooperative Extension proposes to improve its use of resources by designating "centers of excellence" at one or more land-grant universities. A center would focus on a priority food, nutrition, and health issue and provide leadership and support in that area for Extension educators on a regional or national basis. It is expected that center professionals will undertake such tasks as: follow research developments regarding a given issue, develop program materials, train Extension staff and other professionals, propose and coordinate collaborative efforts, maintain computerized data files of basic and applied research findings, and serve as authorities on that issue.

USDA will increase its dissemination of up-to-date research data at the Federal level through the Electronic Food and Nutrition Information Service (Section II. B) telecommunication techniques, and other means. Background information on specific nutrition-related areas will continue to be developed by USDA agencies and distributed to State and local leaders and the private sector as part of the Food and Fitness Program.

The National Agricultural Library's Food and Nutrition Information Center (FNIC) will continue to respond to inquiries from researchers, educators and consumers. Publications, "pathfinders" on important nutritional topics, and bibliographies will be developed and kept current to help meet this need.

Additional activities under consideration for improving research and educational linkages include:

- o USDA-sponsored lecture series highlighting nutrition research.
- o Maintenance of a complete repository of all USDA publications that report nutrition research.
- o Training of USDA staff and cooperators in existing and new technologies, such as on-line database searching, database and software management, and development of expert systems.
- o Increased use of electronic mail and "USDA Online" to communicate nutrition information to educators.
- o A user-free telephone to consumer inquiries.

- o An interagency system for identifying nutrition education issues that need to be addressed through new research initiatives to support USDA programs at Federal, State and local levels.

The purpose of these and other activities coordinated through SHN is to increase awareness, by food and nutrition professionals in USDA and elsewhere, of current nutrition research findings and how these findings can and should be translated into usable information.

3. Coordinated delivery of message using both information and education activities.

USDA's nutrition education audiences are the healthy public as well as targeted subpopulations. Often the nutrition message is the same but the intensity or method of delivery may differ.

Current budgetary constraints increase the necessity for cooperative nutrition education efforts as a means of producing highly effective programs. Thus, cooperation among USDA agencies who deliver food and human nutrition information to the general public is essential. Pooling of expertise and other resources by agencies to develop nutrition messages and deliver them is expected to result in information and education programs that have greater conformity of message, cover broader audiences, and effectively use a variety of supporting delivery systems.

Through the Extension Service, USDA can reach every county in all States with nutrition information and education. As the Federal partner, ES coordinates the use of this delivery system to provide research-based educational programs to the general public at all levels. Extension programs adapt nutrition information and design educational programs to address specific needs and learning levels of target audiences ranging from preschool to post graduate.

Many recent activities have been coordinated among USDA agencies at the Federal level to ensure conformity of message and prudent use of resources. Examples include: USDA's Food and Fitness Programs, initiated in 1984 with 22 agencies participating and coordinated by ES, designed to increase public awareness of the abundance and variety of food provided by American agriculture, and the relationship of diet to good health. The FSIS maintains a consumer hotline for meat and poultry food safety questions; however, they get and refer food and nutrition questions to other agencies. The Dietary Guidelines "minibulletins" were developed by HNIS with assistance from ES and other USDA and DHHS nutritionists and are being "delivered" through ES programs, the FSIS information hotline, several DHHS agencies, and others. The "Make Your Food Dollars Count" materials were developed by FNS with assistance by HNIS, ES and others and are used primarily in Food Stamp Program offices and mailings.

Nutrition information delivery at the Federal level in USDA is coordinated through a newly formed Nutrition Information Coordinating Team composed of information specialists from the ten USDA agencies having nutrition-related

activities and chaired by the USDA Office of Information. This team meets regularly to exchange information on agency activities, develop coordinated programs, and investigate potential information outlets for Departmental nutrition information and publications. The team conceived and developed the "Food and Nutrition Information Service" as part of USDA Online, the Department's electronic information service on the Dialcom computer system. The Service carries consumer oriented and generally nontechnical nutrition information from USDA, such as news items, regularly issued releases, entire texts of articles or publications, or selected items from publications, and information about USDA food and nutrition authorities and how to contact them.

Several standing or ad hoc groups with participation from two or more Departments, including USDA, address nutrition education issues. Examples are: USDA-DHHS Nutrition Education Committee for Maternal and Child Nutrition Publications; FDA-sponsored Nutrition Education Task Group (public and private sectors); DHHS-sponsored Ad Hoc Committee for Health Promotion Through School; and USDA-FDA Journalists' Conference.

The coordinating activities described above will be continued and expanded. Some additional activities will be undertaken to improve delivery of food and nutrition information and education:

- o The Human Nutrition Information Coordinating Team (Section II. B. 8.), will be asked to implement more effective and economical means of expanding the use of food and nutrition information. This is necessary because dissemination of information to the general public in print form is costly and is of questionable effectiveness with some audiences.
- o Cooperation with nutrition education professional societies and the food industry will be encouraged.
- o ES will coordinate the development and delivery of sound educational materials through the centers of excellence it proposes to form in land-grant universities and/or through other innovative methods.
- o HNIS will initiate research to identify information sources now preferred and to improve understanding of how persons seek nutrition information and incorporate it into their daily behavior. Sources of nutrition information and learning processes of household food managers will be studied. This group is chosen because it consists predominantly of adult females whose nutrition is a special concern, and because the household food manager influences the diets of other household members. Other groups of interest are the low-income population, pregnant women and infants, children, and the elderly. Findings will be used to develop delivery systems that are most effective.
- o FNIC will develop and publish a bibliography of nutrition education materials suitable for various school age groups.

- o Cooperative efforts by two or more agencies to meet common food and nutrition education delivery objectives will be encouraged.

4. Evaluate Departmental information and education efforts and identify needs for change or for initiation of new nutrition education research and activities.

The activities undertaken to meet goals 1, 2, and 3 above will be evaluated individually by the agency or agencies involved and appropriate actions will be taken. The overall USDA Food and Nutrition Information and Education Program will be examined at least once every three years to see if it is achieving its goal. The Subcommittee for Human Nutrition (Section VI. B.) will serve as the guiding body in this effort. Input may be sought from the various Advisory Committees (Sections VI. C.) and possibly from representatives of private sector groups, such as the food industry, nutrition professionals, consumer groups, and media groups. The Subcommittee will propose any redirection of the Program indicated by their examination to the Administrator(s) of the agencies involved and/or to the USDA Committee on Research and Education for implementation.

V. FUNDING LEVELS (1982-1987)

The expenditures for human nutrition research and human nutrition education and information by the several agencies in USDA for fiscal years 1982 through 1985 are summarized in Table 2. The estimated expenditures for FY 1986 and the budget for FY 1987 are also included. The total amount of human nutrition research support has increased from \$43.5 million in fiscal year 1982 to \$56.5 million in fiscal year 1987, an increase of 29.9 percent. During the same period, support for human nutrition education and information increased from \$123.6 to \$135.2 million or 9.4 percent. The total support for human nutrition in the FY 1987 budget is \$191.7 million.

Table 3 shows the amount of human nutrition research support within the Department for this period by subject area categories and agency. Half of the human nutrition research effort is focused on determining nutrient requirements/health maintenance at all stages of life. One-fourth of the effort relates to the development of methods for measurement of nutritional status and collection of food consumption information. Approximately 1/6 of the funds are used to measure the content and bioavailability of nutrients in foods. The funds shown in the table do not include funds provided by the States or other sources and used in conjunction with those funds provided by the Cooperative State Research Service (CSRS).

Table 4 presents a breakdown of human nutrition education and information expenditures and budgets by subject category for the fiscal years 1983 through 1987.

A summary of actual and estimated expenditures and the FY 1987 budget is given in Table 5 for the five different Human Nutrition Research Centers and other Laboratories or Centers with the Agricultural Research Service (ARS) for fiscal year 1982 through fiscal year 1987. The net figure refers to the funds to the location, while the gross amount includes other overhead costs. Table 5 also indicates the number of ARS scientist years and non-ARS scientist years (SY) involved.

The Center at Tufts University in Boston is operated by ARS as a government-owned, contract-operated (GOCO) facility. The Center at Baylor College of Medicine in Houston is operated by ARS through a cooperative agreement.

Human nutrition research support at ARS Regional Research Centers and other Laboratories is shown in Table 6. These studies help to assure that problems and opportunities in human nutrition are considered in research directly related to the quality of the food supply.

Table 2

U.S. DEPARTMENT OF AGRICULTURE
HUMAN NUTRITION RESEARCH, EDUCATION AND INFORMATION
SUPPORT (FY 82-87)

HUMAN NUTRITION RESEARCH
(\$ in Millions)

	FY 1982 actual	FY 1983 actual	FY 1984 actual	FY 1985 actual	FY 1986* est.	FY 1987 budget
ARS	25.5	31.7	34.3	36.9	37.8	40.3
CSRS	8.7	7.8	7.7	7.7	7.9	7.9
HNIS	8.0	6.7	5.3	6.0	12.8	6.2
ERS	1.4	0.9	0.7	0.7	1.1	1.2
FNS	--	0.7	5.4	1.4	1.5	0.9
TOTAL	43.5	47.8	53.4	52.7	61.1	56.5
Human Nutrition Education and Information						
ES	73.5	76.1	76.6	77.0	73.5	73.5
HNIS	1.2	1.0	0.7	0.7	0.7	0.7
FNS	48.5	42.0	50.5	55.0	57.6	60.3
FSIS	0.4	0.4	0.3	0.5	0.4	0.2
NAL	--	0.4	0.4	0.4	0.5	0.5
TOTAL	123.6	120.0	128.5	133.6	132.7	135.2
<u>TOTAL RESEARCH, EDUCATION AND INFORMATION</u>	167.1	167.8	181.9	186.3	193.8	191.7

*After Gramm, Rudman and Hollings Bill

Table 3

USDA NUTRITION RESEARCH PROGRAM SUPPORT (FY 82-87)
(\$ in Millions)

	<u>FY</u> <u>1982</u> <u>actual</u>	<u>FY</u> <u>1983</u> <u>actual</u>	<u>FY</u> <u>1984</u> <u>actual</u>	<u>FY</u> <u>1985</u> <u>actual</u>	<u>FY</u> <u>1986*</u> <u>est.</u>	<u>FY</u> <u>1987</u> <u>budget</u>
1. Nutrient Requirements/ Health Maintenance						
CSRS	4.0	2.7	3.3	3.6	3.7	3.7
ARS	21.0	26.4	27.3	26.3	27.5	29.1
Total	25.0	29.1	30.6	29.9	31.2	32.8
2. Nutritional Status/ Food Intake						
CSRS	3.1	2.8	2.8	2.3	2.4	2.4
ARS	0.4	0.7	0.6	2.3	3.1	3.9
HNIS	5.0	3.5	2.6	3.2	9.9	3.3
Total	8.5	7.0	6.0	7.8	15.4	9.6
3. Use of Food/Food Choices						
CSRS	0.3	0.4	0.3	0.2	0.2	0.2
HNIS	1.2	1.7	1.1	1.1	1.1	1.1
ERS	.8	.6	0.4	0.4	0.8	0.8
Total	2.3	2.7	1.8	1.7	2.1	2.1
4. Nutrient Composition/ Bioavailability						
CSRS	1.2	1.8	1.3	1.6	1.6	1.6
ARS	4.0	4.7	6.5	8.3	7.2	7.3
HNIS	1.4	1.5	1.6	1.7	1.8	1.8
Total	6.6	8.0	9.4	11.6	10.6	10.7
5. Nutritional Impacts of Programs						
CSRS	0.1	0.1	--	--	--	--
ERS	0.5	0.3	0.3	0.3	0.3	0.4
FNS	0.5	0.7	5.4	1.4	1.5	0.9
Total	1.1	1.1	5.7	1.7	1.8	1.3
TOTALS						
CSRS	8.7	7.8	7.7	7.7	7.9	7.9
ARS	25.5	31.7	34.3	36.9	37.8	40.3
HNIS	8.0	6.7	5.3	6.0	12.8	6.2
ERS	1.4	0.9	0.7	0.7	1.1	1.2
FNS		0.7	5.4	1.4	1.5	0.9
USDA Total Nutrition Research	43.5	47.8	53.4	52.7	61.1	56.5

*After Gramm-Rudman-Hollings Bill

Table 4

USDA FOOD AND NUTRITION EDUCATION AND INFORMATION SUPPORT (FY 83-87)
(\$ in Millions)

	<u>FY 1983</u>	<u>FY 1984</u>	<u>FY 1985</u>	<u>FY 1986</u> <u>1/</u>	<u>FY 1987</u> budget
Extension Service ^{2/}					
Extension (Formula est.)	15.8	16.2	16.7	15.9	15.9
Expanded Food and Nutrition Education Program (EFNEP)	60.4	60.4	60.3	57.6	57.6
Total	<u>76.1</u>	<u>76.6</u>	<u>77.0</u>	<u>73.5</u>	<u>73.5</u>
National Agricultural Library					
Food, Nutrition and Human Ecology Staff	0.4	0.4	0.4	0.5	0.5
Human Nutrition Information Service					
Nutrition Education Division	1.0	0.7	0.7	0.7	0.7
Food and Nutrition Service ^{2/}					
Nutrition Education & Training Program (NET)	5.0	5.0	5.0	5.0	5.0
Special Supplemental Food Program for Women, Infants and Children (WIC) ^{3/}	<u>37.0</u>	<u>45.5</u>	<u>50.0</u>	<u>52.6</u>	<u>55.3</u>
Total	<u>42.0</u>	<u>50.5</u>	<u>55.0</u>	<u>57.6</u>	<u>60.3</u>
Food Safety and Inspection Service					
Nutrition Labeling	0.08	0.1	0.1	0.1	0.1
Nutrition and Sodium Information	0.06	0.1	0.1	0.1	0.1
Sodium Monitoring Program	<u>.28</u>	<u>0.1</u>	<u>0.3</u>	<u>0.2</u>	<u>0.0</u>
Total	<u>0.42</u>	<u>0.3</u>	<u>0.5</u>	<u>0.4</u>	<u>0.2</u>
USDA Total Nutrition Education and Information ^{2/}	120.0	128.5	133.6	132.7	135.2

^{1/}After Gramm-Rudman-Hollings Bill

^{2/}Most funds are distributed to and managed by State agencies

^{3/}Estimate of State administrative funds allocated for nutrition education

Table 5

AGRICULTURAL RESEARCH SERVICE
HUMAN NUTRITION RESEARCH SUPPORT (FY 1982-87)

Estimated Funds and Scientist Years (In millions of dollars)

		FY 1982 actual	FY 1983 actual	FY 1984 actual	FY 1985 actual	FY 1986* est.	FY 1987 budget
BHNRC, Beltsville, MD	Gross	7.77	7.92	7.97	8.00	7.91	8.16
	Net	6.75	6.98	6.98	7.30	7.02	7.25
	ARS SY	42	40	39	43	43	42
	Non-ARS SY	4	5	5	6	6	6
GFHNRC, Grand Forks, ND	Gross	3.60	5.41	5.72	6.19	6.36	6.61
	Net	3.24	5.06	5.33	5.57	5.64	5.90
	ARS SY	12	12	10	11	8	10
	Non-ARS SY	2	2	2	2	2	2
HNCA, Boston, MA	Gross	5.55	7.19	9.59	11.35	11.75	12.75
	Net	4.99	6.84	9.12	10.79	11.16	12.11
	ARS SY	1	1	1	1	1	1
	Non-ARS SY	30	33	37	42	42	44
CNRC, Houston, TX	Gross	2.94	2.95	3.27	3.59	4.43	5.43
	Net	2.67	2.69	2.96	3.23	3.93	4.88
	Non-ARS SY	18	20	21	21	20	22
WHNRC, San Francisco, CA	Gross	2.10	3.48	3.81	3.79	3.66	4.16
	Net	1.84	3.05	3.33	3.42	3.25	3.70
	ARS SY	7	7	13	13	13	16
TOTAL, HN Centers	Gross	21.96	26.95	30.36	32.93	34.12	37.12
	Net	19.49	24.61	27.70	30.31	31.01	33.81
	ARS SY	62	60	63	68	65	69
	Non-ARS SY	56	60	65	71	70	74
Other ARS HN Research	Gross	3.25	3.93	3.97	3.88	3.65	3.14
	Net	2.68	3.25	3.27	3.49	3.24	2.83
	ARS SY	31	32	29	29	29	25
TOTAL, Human Nutrition	Gross	25.21	30.88	34.33	36.81	37.76	40.26
	Net	22.17	27.86	30.97	33.80	34.24	36.64
	ARS SY	93	92	92	97	94	94
	Non-ARS SY	56	60	65	71	70	74

*After Gramm-Rudman-Hollings Bill

Table 6

AGRICULTURAL RESEARCH SERVICE

OTHER ARS HUMAN NUTRITION RESEARCH SUPPORT (FY 82-87)*
(In thousands of dollars)

		FY <u>1982</u> actual	FY <u>1983</u> actual	FY <u>1984</u> actual	FY <u>1985</u> actual	FY** <u>1986</u> est.	FY <u>1987</u> budget
Beltsville, MD	Gross	132.0	187.0	187.0	--	--	--
	Net	109.6	155.0	155.0	--	--	--
Ithaca, NY	Gross	292.8	295.5	305.0	551.5	601.3	741.6
	Net	240.5	242.1	246.7	496.6	533.5	667.4
Wyndmoor, PA	Gross	276.3	573.7	580.2	700.5	667.1	299.4
	Net	226.6	468.6	471.2	630.6	591.8	269.5
Peoria, IL	Gross	1,073.2	1,178.5	1,184.4	1,023.8	985.5	970.0
	Net	896.7	983.7	985.3	921.7	874.5	873.0
Albany, CA	Gross	1,195.6	1,400.4	1,412.2	1,007.9	959.2	703.8
	Net	982.7	1,157.1	1,161.3	907.5	851.0	633.4
Athens, GA	Gross	275.1	291.4	302.2	149.0	--	--
	Net	223.3	244.6	249.8	134.1	--	--
Hyattsville, MD	Gross	--	--	--	449.0	433.5	427.2
	Net	--	--	--	404.2	384.6	384.5
	Gross	3,245.0	3,926.5	3,971.0	3,881.7	3,646.6	3,142.0
	Net	2,679.4	3,251.1	3,269.3	3,494.7	3,235.6	2,827.8

*Excludes Human Nutrition Centers

**After Gramm-Rudman-Hollings Bill

VI. COORDINATION AND ADVISORY MECHANISMS

A. Coordination Within the Federal Sector

1. Interagency Committee on Human Nutrition Research

Nutrition research has been coordinated at the Federal level since 1983 through the Interagency Committee on Human Nutrition Research (ICHNR) cochaired by the Assistant Secretary for Science and Education, USDA, and the Assistant Secretary for Health, Department of Health and Human Services. This committee includes the U.S. Departments of Agriculture, Commerce, Defense, and Health and Human Services; Agency for International Development; National Aeronautics and Space Administration; National Science Foundation; and Office of Science and Technology Policy. The ICHNR has guided the establishment of the Human Nutrition Research Information Management System (HNRIMS), a computerized data base of ongoing Federal food and human nutrition research, to facilitate the rapid exchange of information among agencies. This computerized data base of ongoing Federal food and human nutrition research is based on a definition of human nutrition research and a classification system with 35 coding categories first developed by the Joint Subcommittee on Human Nutrition Research (JSHNR) of the Committee on Health and Medicine and the Committee on Food and Renewable Resources of the Federal Coordinating Council on Science, Engineering and Technology in the Office of Science and Technology Policy, later revised and adopted by the ICHNR. Human nutrition research as defined encompasses research in five major areas: (1) biomedical and behavioral sciences, (2) food sciences, (3) nutrition monitoring and surveillance of populations, (4) nutrition education methodology, and (5) effects of socioeconomic factors and intervention programs and policies on food consumption and nutritive status.

One mechanism for information exchange and coordination used by the JSHNR and continued by the ICHNR has been biennial conferences of federally supported human nutrition research units and centers. The first Conference was held December 16-17, 1982, where senior staff of these Centers shared an overview of their activities. At the second conference on January 14-15, 1985, the meeting focused on two broad topics of research: the use of stable isotopes in human nutrition research and methods for the determination of body composition in humans. Reports of these conferences have been published. A third conference is planned for early 1987. USDA personnel have played a major role in these efforts.

The ICHNR has completed the preparation of a Federal 5-year plan for human nutrition research. Five areas of research have been proposed for special Federal attention. These are listed on pages 28-30.

The Human Nutrition Research Information Management System (HNRIMS), although a tool for improved coordination, is a coordinated effort in itself. The HNRIM system operates out of the National Institutes of Health Nutrition Coordinating Committee (NIH/NCC) office and also is linked into the existing USDA Current Research Information System (CRIS). Federal agencies which conduct or support human nutrition research contribute information annually to HNRIMS and have access to the system for retrieval of nutrition information. The agencies involved include DHHS, USDA, VA, AID, DOC, DOD, NASA and NSF.

B. Coordination Within USDA

1. Subcommittee for Human Nutrition

The nutrition activities of the Department of Agriculture are coordinated by the Subcommittee for Human Nutrition of the USDA Research and Education Committee of the Secretary's Policy and Coordination Council. The Subcommittee for Human Nutrition holds an open meeting monthly usually from 2 to 3:30 p.m. on the third Thursday. It is composed of representatives from the Agricultural Research Service; Agricultural Marketing Service; Cooperative State Research Service; Human Nutrition and Information Service; Extension Service, Food and Nutrition Service; Food Safety and Inspection Service; Economic Research Service; Office of International Cooperation and Development; Food and Nutrition Information Center of the National Agricultural Library; Office of Governmental and Public Affairs; Cooperative Research Grants Office; and Higher Education Office of Grants and Programs Systems; Food and Consumer Services; and Science and Education. The Subcommittee for Human Nutrition is chaired by Dr. Gerald F. Combs, Assistant Deputy Administrator for Human Nutrition, ARS.

The Subcommittee's primary purpose is to ensure communication among agencies involved in human nutrition activities within the Department. It further serves as the Department's mechanism to explore and recommend positions on human nutrition related policy issues. The Subcommittee has developed a food and nutrition policy statement, a directory of USDA activities related to human nutrition, a 5-year research plan, and a statement on the role of USDA in human nutrition.

In addition, the Subcommittee on Human Nutrition has established a Dietary Guidance Working Group to ensure that USDA speaks with one voice on dietary guidance. This Working Group is chaired by Dr. Susan Welsh, HNIS, and has members from each USDA agency involved in any way with dietary guidance, as well as liaison members from DHHS and other agencies.

The objectives of the Dietary Guidance Working Group are:

- o To ensure that dietary guidance from USDA conforms to the Dietary Guidelines for Americans, is supported by research-based knowledge, and is objective in presentation.
- o To ensure that dietary guidance is consistent and supportive across USDA Agencies and across Departments of the Federal Government.
- o To coordinate activities that fulfill USDA's responsibility to provide dietary guidance to assist Americans in selecting diets to improve their health and well-being.

C. Advisory Groups

1. Human Nutrition Board of Scientific Counselors

The Human Nutrition Board of Scientific Counselors was established by the Secretary of Agriculture in accordance with Conference Report No. 95-1579 as an

outside group of well-established scientists in human nutrition and related fields to advise the Secretary regarding program direction, priorities, and quality of the Department's human nutrition research and education. The Board has held three 1-1/2 day meetings--on August 9-10, 1984; February 6-7, 1985; and January 9-10, 1986. In addition, Board members have participated in three workshops and two Task Group meetings.

At its first meeting, the Board was charged to review the human nutrition research program directions in USDA, identify any gaps or changes in emphasis needed, and to advise the Secretary of ways the Department's research program can be improved. Specifically, the Board was asked to consider the implications of the increasing diet and health concerns on the food production/processing system, what research areas in human nutrition need priority attention, and how can research findings be translated more effectively into timely nutrition education and information.

At its second meeting, the Board visited USDA's oldest Human Nutrition Research Center at Beltsville and reviewed its ongoing program. The Board considered the Center to be internationally recognized and contributing substantially to the mission and goals of USDA in human nutrition research. The Board also considered the level of funding of competitive grants in human nutrition as far below a reasonable and adequate level.

The three Task Groups, formed at the first meeting of the Board, reported on their activities at the third meeting. These included Task Groups on (1) Solutions to Human Nutrition Problems Through Changes in the Agricultural/Food System, (2) Food Composition, and (3) Implications of the RDAs and Dietary Guidelines.

Finally, discussions of the Board members revealed a clear concern about the role of USDA in meeting the nutritional education needs of the public. This led to the formation of a new Task Group on Nutrition Education with a charge of determining the kinds of initiatives required to formulate and integrate a broad-based nutrition education program which would utilize present resources efficiently.

The Human Nutrition Board of Scientific Counselors offered the following recommendations in their report dated June 4, 1986, to the Secretary of Agriculture:

- o That the \$2.5 million provided in FY 1986 for competitive grants in human nutrition research be increased to \$6.5 million in order to fund 25% of the approved dollars to take advantage of the competence and to gain the commitment of the outstanding nutrition scientists in universities and other research centers throughout the nation.
- o That the competitive grants program be expanded to include research that focuses on assessment of dietary practices, development of quality materials to meet consumer information needs, and determination of the composition of foods.

- o That the substantial new capital requirements of the Beltsville Human Nutrition Research Center for equipment and physical plant, especially for animal facilities, and adequacy of budget (\$10 million annually) be provided to ensure that this well-established and internationally recognized Center continue to contribute to the mission and goals of USDA at a high level of productivity.
- o That adequate support be provided for food composition research, with continued emphasis on sampling methods, data handling procedures, and active collaboration with other agencies, since accurate data on food composition are basic to the development of nutrient requirements and useful dietary guidance recommendations.
- o That USDA research projects be evaluated for their impact on nutritional value of the end product as related to humans, and that appropriate plant and animal model systems be developed.
- o That basic scientific research in USDA be expanded so as to serve as the basis for development, by the private sector, of food processing, packaging, and distribution technologies to produce more nutritious foods.
- o That the relationship between food, nutrition, and health as expressed in the "Dietary Guidelines for Americans" continue to be the central theme in USDA's human nutrition information and education activities.
- o That USDA strengthen its efforts to provide sound research-based food and nutrition information to the public and that governmental agencies "speak with one voice" so that consumers are not confused.

2. Dietary Guidelines Advisory Committee

The Dietary Guidelines Advisory Committee was established in 1983 by the Secretary of Agriculture in accordance with Senate Appropriations Committee Conference Report No. 96-1030 of November 20, 1980. The Committee was to review the Dietary Guidelines for Americans published jointly by the two departments in 1980. The Committee was to consider comments solicited and received from the "public" about the 1980 Guidelines and advances in the state of knowledge in nutrition and dietary planning since the 1980 Guidelines were issued. After this review the Committee was to make any recommendations it deemed appropriate to the Secretaries of USDA and HHS. The Secretary appointed nine members to the Committee--three selected by USDA, three selected by DHHS, and three selected from a list of nominees recommended by the National Academy of Sciences. USDA's Human Nutrition Information Service provided support to the Committee and was responsible for processing, publishing, and distributing its reports.

The Committee held four open meetings during 2 years. Their final report, published in April 1985, proposed revised text for the Dietary Guidelines and four recommendations to the Departments:

- o The revised Dietary Guidelines should be used as the basis for policy development related to Federal nutrition education and information programs of both Departments.

- o The Departments should publish and plan a broad public distribution of the publication presenting the revised Dietary Guidelines.
- o The Departments should convene an advisory committee of nationally recognized nutrition authorities to review these Dietary Guidelines for scientific accuracy and appropriateness on a 5- to 10-year cycle.
- o The Department of Agriculture should continue work aimed at developing a system of simple food groupings consistent with the currently available food supply that can be used in nutrition education programs related to Dietary Guidelines concepts.

The revised text proposed by the Committee, after review by nutrition scientists in the two Departments, formed the basis for the Second Edition of "Nutrition and Your Health: Dietary Guidelines for Americans," published in August 1985. In accordance with Committee recommendations, both Departments use the new Guidelines as a basis of nutrition education and information programs. In less than a year after release, over 2 1/2 million copies of the Guidelines have been distributed free by the two Departments and many more have been reproduced and distributed by others. USDA's Human Nutrition Information Service is the focal point for the development of guidance to help the public put the Guidelines into practice. For this purpose the agency has published the first seven of a series of fourteen short bulletins.

Future plans for the Human Nutrition Information Service include sponsoring the convening of a new joint Dietary Guidelines Advisory Committee to review the Guidelines with respect to advances in nutrition knowledge on a 5- to 10-year cycle. The Department will also continue its efforts to help the public understand and implement the Dietary Guidelines.

3. Joint Nutrition Monitoring Evaluation Committee

The Joint Nutrition Monitoring Evaluation Committee (JNMEC) was established by USDA and DHHS in October 1983 to review, interpret, and report information from the National Nutrition Monitoring System (NNMS) on the nutritional status of the U.S. population.

The NNMS incorporates Federal research and survey activities, primarily in USDA and DHHS, with the overall purpose of monitoring the nutritional status of the U.S. population. Major components of the system are health status measurements, food consumption measurements, food composition measurements, assessments of dietary knowledge and attitudes, and food supply determinations.

The goals of the NNMS are as follows:

- o To provide the scientific foundation for the maintenance and improvement of the nutritional status of the U.S. population and the nutritional quality and healthfulness of the national food supply.
- o To collect, analyze, and disseminate timely data on the nutritional and dietary status of the U.S. population, the nutritional quality of the food

supply, food consumption patterns, and consumer knowledge and attitudes concerning nutrition.

- o To identify high-risk groups and geographic areas, as well as nutrition-related problems and trends, in order to facilitate prompt implementation of nutrition intervention activities.
- o To establish national baseline data and to develop and improve uniform standards, methods, criteria, policies, and procedures for nutrition monitoring.
- o To provide data for evaluating the implications of changes in agricultural policy related to food production, processing, and distribution which may affect the nutritional quality and healthfulness of the U.S. food supply.

The JNMEC functioned as a Federal Advisory Committee. Four scientists from outside the Federal Government were appointed by the Assistant Secretary for Food and Consumer Services, USDA, and the Assistant Secretary for Health, DHHS, who jointly chaired the Committee.

Their report, entitled Nutrition Monitoring in the United States--A Progress Report from the Joint Nutrition Monitoring Evaluation Committee, was submitted to Congress on July 15, 1986, by the two Departments. It is the first report to consolidate information from the National Nutrition Monitoring System to provide a comprehensive review of the nutritional status of the U.S. population.

The nutritional status of the U.S. population was inferred from dietary data, primarily from USDA's 1977-78 Nationwide Food Consumption Survey; and health data, primarily from DHHS's 1976-80 National Health and Nutrition Examination Survey. This information is intended to provide a foundation for future reports which will incorporate new information from the National Nutrition Monitoring System.

The Committee concluded that, in the United States, the food supply is safe and adequate, indeed, abundant. Although some Americans may not have sufficient food, clinically significant nutritional deficiencies for which the diet is responsible are relatively rare.

Nutrition-related health problems affected by public health policy were addressed in the report. The Committee found that principal nutrition-related health problems experienced by Americans arise from overconsumption of fat, saturated fatty acids, cholesterol, and sodium--food components believed to be associated with an increased risk of developing cardiovascular diseases. Overweight is also a nutrition-related health problem, with twenty-eight percent of the population ages 25-74 years overweight. It is most prevalent among black women and women below the poverty level, and is associated with increased risk of hypertension and diabetes.

Dietary intakes of iron and vitamin C are low in certain subgroups of the population. Impaired iron status is most prevalent among young children and females of childbearing age, especially those children and women who are black or poor. Evidence of vitamin C depletion is most prevalent among the poor,

especially adult males who smoke cigarettes. Also, low intakes of calcium among women are a concern because some studies have linked calcium deficiency to increased risk of osteoporosis among postmenopausal white women.

The Committee recommends that while the entire dietary spectrum requires continued monitoring, special emphasis should be given to food energy, total fat, saturated fatty acids, cholesterol, sodium, and alcohol because of relatively high dietary consumption; and to vitamin C, calcium, iron, and fluoride because of relatively low dietary consumption.

The report includes discussions of the dietary sources of the food components and trends in consumption patterns since the beginning of the century. Also included is a discussion of how various socioeconomic factors affect food choices. In addition, ways of improving the National Nutrition Monitoring System are recommended.

An operational plan for NNMS to the mid 1990's will incorporate the Committee's recommendations, as well as plans for future reports on the nutritional status of the U.S. population.

4. National Advisory Council on Child Nutrition; and National Advisory Council on Maternal, Infant, and Fetal Nutrition

The function of both Councils is to make a continuing study of Food and Nutrition Service's Special Nutrition Programs so as to determine how program administration and operation can be improved. The law mandates that both Councils report their recommendations for administrative and legislative changes to the President and Congress annually.

Members of each Council are appointed by the Secretary of Agriculture. To ensure a balance of differing views, members are drawn from government, industry, advocacy organizations and other specific fields (e.g., a school administrator or a nutrition expert) that are related to the programs administered.

5. Ad Hoc Committee on Health Promotion Through Schools

On the recommendation of the participants at a 1983 interagency meeting on health promotion through the schools, an ad hoc interagency committee was established. Representatives from across the Federal government meet regularly to communicate activities and to coordinate efforts where appropriate. USDA has participated on the committee since its inception.

6. USDA/DHHS Nutrition Education Committee for Maternal and Child Nutrition Publications

In response to a need for a mechanism for a joint effort on nutrition education materials related to pregnancy and infant care, the Assistant Secretary for Health, DHHS, and the Assistant Secretary for Food and Consumer Services, USDA, established the USDA/DHHS Nutrition Education Committee for Maternal and Child Nutrition Publications in November 1980. The committee serves as a systematic mechanism for agencies within USDA and DHHS to report their plans and progress

related to maternal and child nutrition education in an effort to avoid duplication and make more effective use of resources. An FNS staff member serves as Department coordinator for this joint effort.

D. Examples of Coordination

The five ARS Human Nutrition Research Centers maintain close communication with each other and with other USDA agencies (e.g., FNS and HNIS) as well as the Institutes at the NIH. The USDA Human Nutrition Research Center on Aging at Tufts University, Boston, Massachusetts, and the USDA Children's Nutrition Research Center at Baylor College of Medicine, Houston, Texas, actively coordinate their research activities with the National Institute on Aging and the National Institute on Child Health and Human Development, respectively. Each Institute is represented on the advisory bodies for those Centers.

Examples of coordination by ARS with other agencies include the very close interaction of the ARS Food Composition Laboratory and the HNIS Nutrient Data Research Branch in planning and conducting food composition studies and in compiling and documenting results. The ARS Human Nutrition Research Center at Beltsville, Maryland, and the the National Heart, Lung and Blood Institute of NIH have a long history of collaboration in food composition research directed primarily toward developing accurate, precise methods for determination of lipids in foods, particularly fatty acids and cholesterol. The Nutrient Composition Laboratory also has conducted research supported by the National Cancer Institute to develop methods for measuring carotenoids in foods. In FY 1986, the Nutrient Composition Laboratory received more than 1/4 of its support from these two Institutes at NIH. In addition, the Lipid Nutrition, Nutrient Composition, and Vitamin and Mineral Nutrition Laboratories of the Center have collaborated with the National Cancer Institute in studies on dietary fat and steroid metabolism in relation to cancer risk in healthy adults. Collaborative studies also are underway with the National Bureau of Standards in the development of appropriate food/biological reference materials characterized for nutrient content.

The FNS and HNIS cooperate in the development of certain food assistance program standards, such as the thrifty food plan for establishing benefits in the Food Stamp Program and meal patterns for measuring compliance in the National School Lunch Program. HNIS-generated data bases on food composition and food consumption and prices are used in developing the standards. The ERS and HNIS cooperate in estimating and publishing information on trends in the nutrient content of U.S. food supplies.

Human Nutrition Information Coordinating Team - Information directors or their representatives of the ten USDA agencies having nutrition or nutrition-related activities meet monthly to exchange information on agency nutrition information activities, develop coordination and cooperation between agencies on these and other nutrition information activities, develop coordinated departmental nutrition information programs, and investigate potential information outlets for agency and department nutrition information.

Formed in 1985, the team is chaired by the USDA Office of Information with members representing the Agricultural Marketing Service, Agricultural Research

Service, Economic Research Service, Extension Service, Food and Nutrition Service, Food Safety and Inspection Service, Human Nutrition Information Service, National Agricultural Library, and Office of Consumer Advisor.

The HNIS/USDA and the National Center for Health Statistics (NCHS), DHHS, are continuing their joint planning and collaboration in conducting the USDA Food Consumption Survey and the NCHS National Health and Nutrition Examination Survey, the core surveys of the National Nutrition Monitoring System. This collaboration as well as the joint publication of the Dietary Guidelines for Americans are coordinated by the Assistant Secretaries for Health in DHHS and for Food and Consumer Services in USDA.

The Agency for International Development (AID) also continues to support two Resource Services Support Agreements in the area of nutrition with USDA. These agreements involve:

- o Interagency reimbursement agreement from AID to USDA on the use of blended foods and weaning foods in food supplementation programs entitled "Food and Nutrition Technical Services."
- o Interagency reimbursement agreement from AID to USDA to assist in the "Economic Analysis of Agricultural Policy."

In addition, some members of the USDA Subcommittee for Human Nutrition frequently represent the USDA on other coordinating committees such as the (1) NIH Nutrition Coordinating Committee, (2) The National Cholesterol Education Program Coordinating Committee, (3) Interagency Committee on Heart, Lung and Blood Disease, (4) Interagency Committee on Aging, (5) DHHS' Nutrition Publications Committee, and FDA's Nutrition Education Task Force. These contacts are useful in information transfer across agencies.

VII. STRATEGIES

A successful program in food and nutrition research and education requires the determination of nutrient needs and food sources of these nutrients, the monitoring of food consumption practices and the nutritional quality of diets, as well as the development of information and techniques to foster the selection of healthful diets by Americans. The program's effectiveness hinges on problem-oriented research coupled with research-based nutrition education of professionals and the public. Such nutrition education efforts may lead to changes in consumer demand, which, in turn, provide industry with the opportunity to market modified and nutritionally improved food products. This is one way that new research discoveries can be instrumental in bringing about changes in the food supply.

Key strategies in this National Food and Nutrition Research and Education Program are as follows:

Strategy 1 - USDA will conduct problem-oriented food and nutrition research on problems of national importance to policy makers, nutrition and health professionals, to food producers and processors, and to the public.

This strategy addresses the need for program relevance and effectiveness. Available resources will be focused on high-priority relevant problems of national interest. The ARS implementation plan, for example, contains a series of problems and subproblems which guide researchers in the selection of high-priority national problems. Solutions to national problems in human nutrition can be expected to lead to corresponding improvement in the nutritional quality of the food supply through a well-organized educational and informational system for the transfer of technology.

Strategy 2 - USDA will place increasing emphasis on a multidisciplinary approach to research, the establishment of centers of excellence, and use of databanks.

This strategy recognizes the need to employ multidisciplinary expertise and an adequate level of resources to effectively solve complex problems. The five ARS Human Nutrition Research Centers and HNIS Nutrition Monitoring and Nutrition Education Divisions are examples of centers of excellence with multidisciplinary competence. Others may be formed at land-grant universities with special emphasis on providing research-derived information for ES professionals at Federal, State and county levels.

Strategy 3 - USDA will expand its capability to monitor the food consumption and dietary status of Americans as part of a USDA/DHHS Operational Plan for Nutrition Monitoring.

This strategy recognizes the need for more timely information to monitor changes in the food consumption behavior of Americans. We know that food consumption may be affected by changes in the economy, by a more complex food supply available to consumers in the market place, and by dietary guidance information received by the public. An expanded capability of USDA to monitor Americans' food consumption changes will be led by HNIS' food consumption surveys, backed by the most current information on the nutrient composition of foods available in HNIS' Nutrient Data Bank.

Strategy 4 - USDA will continue to coordinate food and human nutrition program activities with those of other Federal agencies, State and local agencies, and the private sector.

This strategy addressess the need for coordination and consolidation of effort to improve the overall effectiveness of the national food and nutrition research and education program, while reducing the chances of duplication of effort.

Strategy 5 - USDA will continue to emphasize and strengthen its activities in technology transfer, information and education in the area of food and human nutrition.

This strategy recognizes the power of research-based information and the need to use proven techniques to rapidly disseminate food and nutrition information to professionals and the general public. New information about food and nutrition, if soundly based and astutely applied, helps the consumer select a healthful diet and can lead to changes in food demand.

Strategy 6 - The message content for USDA's food and human nutrition information and education objectives will be centered around the Nutrition and Your Health: Dietary Guidelines for Americans.

This strategy recognizes the need for nutrition information for the public that is consistent and reflects a consensus of opinion of nutrition scientists on the characteristics of diets that promote nutritional health and reduce risk of chronic diseases. USDA, working with DHHS, will strive to insure that all governmental agencies "speak with one voice" in providing dietary guidance to consumers.

VIII. BENEFITS

Potential benefits of improved diet and nutrition are better health and a longer, more active, and more satisfying life. The development of new food and nutrition knowledge, as well as the application of existing knowledge are essential to alleviation of diet-related health problems and to increased individual performance and satisfaction. Through this National Food and Human Nutrition Research and Education Program, USDA aims to develop and apply knowledge important to the diet-related health, performance, and satisfaction of Americans.

New food and nutrition knowledge from USDA research benefits the many segments of the population who produce and market food and who educate and provide health services to the public. It is required by policy makers who formulate food assistance, public health and education programs. It forms the information base for dietary guidance for the public.

This National Food and Nutrition Program will lead to up-to-date and comprehensive analytical data on the nutrient composition of foods in the forms that humans can use to meet their nutritional needs. When the long-range objectives have been achieved, reliable information will be readily available to determine the kind and amounts of nutrients in foods and diets. The technology will be available to improve the nutritional values of foods where less than a desirable dietary level has been obtained by virtue of food choice, economic constraints, unusual needs, etc. Changes in the nutrient content between production on the farm and preparation for the table can be taken into account and thus guide producers, processors, the food service industry, and consumers.

Advances in technology should make it possible to minimize nutritional inadequacies of most diets or diet patterns. The consumer will benefit from knowledge of the nutritional usefulness of foods and be assured of better nutrition where some foods have been improved. Health professionals, nutrition educators, food program directors, and the food service industry, will benefit from additional nutritional knowledge.

The technology contained in the National Food and Nutrition Program will enable physicians, dietitians, nutritionists, and food program directors to give better nutritional guidance for food selection. The USDA agencies involved in supplemental feeding will have an improved scientific basis for food selection in their food distribution or food programs aimed at improving nutritional health. Industry also will have adequate guidelines on changes in nutrient content of foods arising from processing, so that products might be improved where indicated.

For the consumer, better health may be enjoyed through improved nutrition resulting from diets providing the right amount and types of nutrients. People will be more nearly able to achieve their full genetic potential, including resistance to disease, intellectual development, and physiological well-being. In the U.S. these can be significant consequences of improved nutrition. For the people of the developing world, with their considerable nutrition problems, these improved health consequences should be immeasurably greater.

There also may be increased economic benefits for different segments of the population, through increased working efficiency, an increase in the productive life span, and reduction in days lost from work and school.

The potential economic benefits from improvement of human nutrition resulting from research findings were estimated in 1971 at several billions of dollars annually*. These "potential" benefits, that new knowledge of food needs might make possible, included significant reduction of health costs for heart and vascular problems; reduced hospital costs in connection with respiratory and infectious diseases; reduced costs associated with arthritis; savings from less expenditures for dental services; savings for people with eyesight problems; significant reduction of health costs for acute digestive problems; and losses associated with alcoholism. Many other problems which had some nutrition involvement leading to tangible benefits but for which dollar benefits were not estimated, included anemia, mental illness, infant mortality, aging, diabetes, osteoporosis, obesity, kidney and urinary problems, and cancer.

Considerable progress has been made since 1971, but many knowledge gaps remain. Undoubtedly, benefits can be expected to be derived from improved nutritional progress that will result during the next decade. Some of these may be because physicians are able to improve health care, because food producers or processors are able to improve the nutritive value of food products, because educators are able to guide families into improved dietary practices, or because Government agencies are able to deliver better nutrition services in the administration of food programs for the needy or those at risk.

*An Evaluation of Research in the United States on Human Nutrition. Rept. 2, Benefits from Nutrition Research. C. E. Weir. SES/USDA Publication, 129 pp., August 1971.



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